Vol. 8, No. 24
December 31, 1983

Energy Research Abstracts

Abstracts 56813-58017

Technical Information Center
UNITED STATES DEPARTMENT OF ENERGY

CURRENT AWARENESS PUBLICATIONS ON ENERGY

To provide complete coverage of literature related to major Department programs, announcement publications that are comprehensive in their coverage of certain energy fields are issued regularly. All information in these publications, plus additional backup information, is included in the Energy Data Base of the Technical Information Center; all references are also available for machine searching via the on-line retrieval system, DOE/RECON, and the commercial on-line retrieval systems. Descriptions of these current awareness publications, which are supported either directly or indirectly by the DOE, appear below. Department of Energy components may receive the listed publications free from the Technical Information Center, P.O. Box 62, Oak Ridge, TN 37830. Telephone (615) 576-1303; (FTS) 626-1303.

PUBLICATIONS OF THE TECHNICAL INFORMATION CENTER

Energy Abstracts for Policy Analysis (EAPA)

A monthly abstract journal devoted to the analysis of energy research, conservation, and policy. Scope and coverage are limited to substantive articles or reports and emphasize the following: programmatic efforts; legislative, regulatory, and other legal aspects; social, economic, and environmental impacts; regional and sectoral analyses; institutional factors, etc. *EAPA* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402; domestic subscribers $6.00, foreign $7.50 per copy; annual cumulative index, domestic $10.00, foreign $12.50 per copy. The annual subscription price is $70.00 for domestic subscribers and $87.50 for foreign subscribers.

Energy Research Abstracts (ERA)

A comprehensive semimonthly abstract journal devoted to all areas of energy-related information produced by the Department of Energy, other U. S. government organizations, and foreign governments. *ERA* is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $165.00 for domestic subscribers and $206.25 for foreign subscribers. A single issue costs $9.50 (domestic) or $11.90 (foreign).

The following publications are available to the public on a subscription basis from the National Technical Information Service (NTIS), Springfield, Virginia 22161. The annual subscription rate for one volume (calendar) year (12 issues plus cumulative index) is $75.00 for domestic subscribers and $150.00 for subscribers outside the North American continent, except as listed below for *DOE Patents Available for Licensing (PAL)*. A single issue is $7.00 (domestic) and $14.00 (outside the North American continent).

Current Energy Patents (CEP)

A monthly publication providing abstracting and indexing coverage of the international patent literature, including patent applications, that concerns any aspect of energy production, conservation, and utilization. Available as PB83-902800.

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DOE is prepared to grant exclusive or nonexclusive, revocable licenses under DOE-owned U. S. patents and patent applications; this semiannual publication provides abstracting and indexing coverage to this literature. Available as PB83-946800; the annual subscription price is $14.00 (domestic) and $28.00 (foreign).

Energy and the Environment (EAE)

A monthly abstract journal devoted to information on the impacts of energy-related activities and radioactive and nonradioactive pollutants on the environment. Available as PB83-914900.

Fossil Energy Update (FEU)

A monthly abstract journal devoted to information on the processing and use of fossil fuels. Available as PB83-914600.

Fusion Energy Update (CFU)

A monthly abstract journal devoted to information on controlled thermonuclear research. Available as PB83-915300.

Solar Energy Update (SEU)

A monthly abstract journal devoted to information on the utilization of solar energy, including biomass and tidal and wind power. Available as PB83-914500.

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A semimonthly current awareness bulletin covering the following areas: photovoltaics, magnetohydrodynamics, electrohydrodynamics, thermoelectrics, thermionics, and fuel cells. Available as PB83-946600.

Geothermal Energy Technology (GET)

A semimonthly current awareness bulletin devoted to information on the exploration and development of geothermal resources. Available as PB83-914700.

Nuclear Fuel Cycle (NFC)

A semimonthly current awareness bulletin covering all aspects of the nuclear fuel cycle, both front end and back end. Available as PB83-913400.

Nuclear Reactor Safety (NRS)

A semimonthly current awareness bulletin covering the following safety aspects: accident analysis, safety systems, radiation protection, decommissioning and dismantling, and security measures. Available as PB83-913500.

Radioactive Waste Management (RWM)

A semimonthly current awareness bulletin covering the following management aspects: transport and storage, waste processing, waste disposal, waste storage, radioactive effluents, and shipping containers. Available as PB83-902900.

INTERNATIONAL ENERGY PUBLICATIONS

The Technical Information Center cooperates with the following organizations in the publication of international abstract journals: (1) International Atomic Energy Agency, International Nuclear Information System, Vienna, Austria, for *Atomindex;* (2) International Energy Agency, IEA Coal Research, London, England, for *Coal Abstracts;* and (3) International Energy Agency, Biomass Conversion Technical Information Service, Dublin, Ireland, for *Biomass Abstracts*. In each case, the cognizant foreign agency provides the non-U.S. information to TIC for inclusion in the Energy Data Base; in turn, TIC provides the U.S. information for input into the respective journal.

Atomindex

A semimonthly abstract journal providing worldwide coverage of information on nuclear science and technology. *Atomindex* is available by subscription from UNIPUB, 345 Park Avenue South, New York, NY 10010. The cost of an annual subscription, 24 semimonthly issues and semiannual and annual cumulative indexes, is $290.

Biomass Abstracts

A bimonthly abstract journal with comprehensive coverage of information in any step involved in the eventual conversion of biomass to energy. *Biomass Abstracts* is available free to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Biomass Abstracts* from Biomass Conversion Technical Information Service, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland, for 42 IR pounds per year. Make checks payable to the Institute.

Coal Abstracts

A monthly abstract journal providing comprehensive worldwide coverage of information in the field of coal science and technology. *Coal Abstracts* is available to Department of Energy components and contractors from the Technical Information Center. Non-DOE organizations may obtain *Coal Abstracts* from IEA Coal Research, Technical Information Service, 14-15 Lower Grosvenor Place, London SW1W 0EX, England, for 100 pounds sterling per year.

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NOTICE

The 1982 Annual Indexes of *Energy Research Abstracts* are available on microfiche. The 5 indexes may be ordered separately or as a set via the following codes and order numbers.

Index	Code	Price	Order No.
1. Corporate Author	A01	$4.50	DE83016307
2. Contract Number	A01	$4.50	DE83016308
3. Report Number and Order No. Correlation	A01	$4.50	DE83016309
4. Personal Author	E01	$6.50	DE83016310
5. Subject	E03	$9.50	DE83016311
6. Set (all 5 Indexes)	E10	$23.50	DE83016312

DOE offices and contractors may order from the DOE Technical Information Center, P.O. Box 62, Oak Ridge, TN 37831; others should order from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161.

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ENERGY RESEARCH ABSTRACTS

ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

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ABOUT *ENERGY RESEARCH ABSTRACTS*

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports, journal articles, conference papers and proceedings, books, patents, theses, and monographs originated by the U. S. Department of Energy, its laboratories, energy centers and contractors. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations. The user should remain aware that *ERA* coverage of non-report literature is limited to that generated by Department of Energy activity.

ERA is comprehensive in its subject scope, encompassing the DOE's research, development, demonstration, and technological programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

ERA is available on an exchange basis to universities, research institutions, industrial firms, and publishers of scientific information. Inquiries should be directed to the Technical Information Center, P. O. Box 62, Oak Ridge, Tennessee 37830.

ERA is available to the public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The subscription rate for the 24 semimonthly issues is $165.00 for domestic subscribers and $206.25 for foreign subscribers. A single issue costs $9.50 (domestic) or $11.90 (foreign). The cumulative indexes will be available in printed form from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, and in microfiche form from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161, and from Engineered Systems, P. O. Box 866, Oak Ridge, Tennessee 37830.

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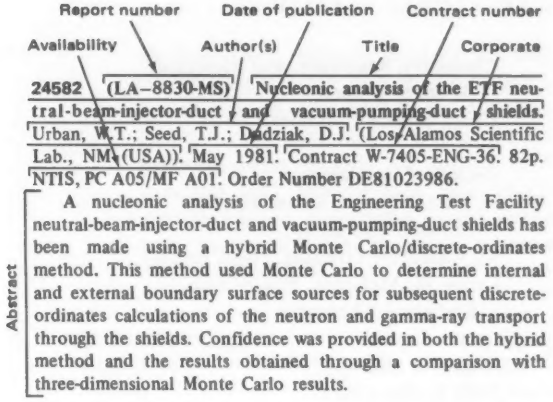
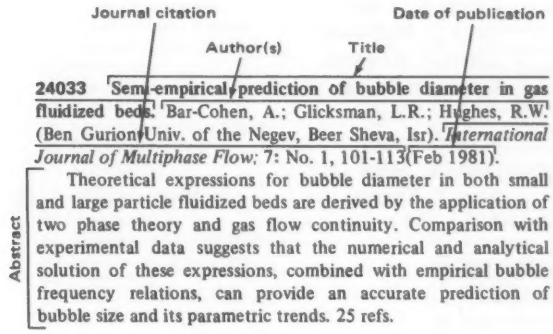
HOW TO USE *ENERGY RESEARCH ABSTRACTS*

ABSTRACTS IN *ENERGY RESEARCH ABSTRACTS*

The principal elements of abstract entries for a typical research and development report and a typical technical journal article are illustrated below.


Report number
Date of publication
Contract number
Availability
Author(s)
Title
Corporate
24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. (Los Alamos Scientific Lab., NM (USA)). May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.
Abstract
A nucleonic analysis of the Engineering Test Facility neutral-beam-injector-duct and vacuum-pumping-duct shields has been made using a hybrid Monte Carlo/discrete-ordinates method. This method used Monte Carlo to determine internal and external boundary surface sources for subsequent discrete-ordinates calculations of the neutron and gamma-ray transport through the shields. Confidence was provided in both the hybrid method and the results obtained through a comparison with three-dimensional Monte Carlo results.


Journal citation
Date of publication
Author(s)
Title
24033 Semi-empirical prediction of bubble diameter in gas fluidized beds. Bar-Cohen, A.; Glicksman, L.R.; Hughes, R.W. (Ben Gurion Univ. of the Negev, Beer Sheva, Isr). International Journal of Multiphase Flow; 7: No. 1, 101-113 (Feb 1981).
Abstract
Theoretical expressions for bubble diameter in both small and large particle fluidized beds are derived by the application of two phase theory and gas flow continuity. Comparison with experimental data suggests that the numerical and analytical solution of these expressions, combined with empirical bubble frequency relations, can provide an accurate prediction of bubble size and its parametric trends. 25 refs.

INDEXES TO *ENERGY RESEARCH ABSTRACTS*

Five indexes are provided for approaching the contents of each issue of *Energy Research Abstracts (ERA)*. Each index is preceded by an introduction that details the organization of the index and the principles by which it was compiled. The reader is referred to these introductions for information not found in the index examples that follow.

• Corporate Author Index

Technical report literature is indexed using the name of the organization or institution responsible for the issuance of the report.

24582 (LA–8830-MS) Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields. Urban, W.T.; Seed, T.J.; Dudziak, D.J. **(Los Alamos Scientific Lab., NM (USA)).** May 1981. Contract W-7405-ENG-36. 82p. NTIS, PC A05/MF A01. Order Number DE81023986.

is indexed as:

Los Alamos Scientific Lab., NM (USA)
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 **(R:US)**

• Personal Author Index

Each author's name is indexed in the form appearing on the document abstracted, with the exception that given names are reduced to initials:

Bar-Cohen, A., Semi-empirical prediction of bubble diameter in gas fluidized beds, 7:24033 **(J:US)**
Dudziak, D.J., *See* Urban, W.T., 6:24582
Glicksman, L.R., *See* Bar-Cohen, A., 7:24033
Hughes, R.W., *See* Bar-Cohen, A., 7:24033
Seed, T.J., *See* Urban, W.T., 6:24582
Urban, W.T., Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 **(R:US)**

• Subject Index

The subject index consisting of entries naming specific materials, objects, and processes is arranged alphabetically. Document titles, informative phrases, or both specific to these entries are arranged alphabetically under the entries.

TOKAMAK ETF
Neutral Atom Beam Injection
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 **(R:US)**
Neutron Transport
Nucleonic analysis of the ETF neutral-beam-injector-duct and vacuum-pumping-duct shields, 6:24582 **(R:US)**

• Contract Number Index

DOE technical literature is indexed using contract numbers under which the literature was produced. This index contains the contract number with corresponding abstract and report numbers.

W-7405-ENG-36	**Los Alamos National Lab., NM (USA)**	
	6:24582	**LA–8830-MS**

• Report Number Index

Technical report literature is also indexed using report numbers. This index includes information on where individual reports may be obtained. Patents and conference papers are indexed here as a matter of convenience. When a report is supplied under an Order Number, that number is included in the availability statement. An Order Number–Report Number Correlation is included for convenience.

LA–		
8830-MS	**6:24582**	**NTIS, PC A05/MF A01. Order Number DE81023986, Distribution Category STD-20d**

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SUBJECT CONTENTS (NUMERICAL LISTING)

Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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Six-digit subject category numbers are used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's computerized bibliographic information system. The six-digit category numbers are utilized as if they were three pairs of two-digit numbers, the first two pairs being used to arrange the abstract content of *Energy Research Abstracts*. The following listing includes the totality of the 40 first-level and 294 second-level subject categories used. Because each issue of *ERA* announces only those documents becoming available during a semimonthly period, some subject categories may not be represented in every issue. The complete subject category scheme with scope notes is available as DOE/TIC-4584-R4 from NTIS for $7.00.

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ENERGY RESEARCH ABSTRACTS

01 COAL AND COAL PRODUCTS

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REFER ALSO TO CITATION(S) 56885, 56891, 57033, 57281, 57301

56813 (DOE/ET/10131—T10) Upgrading of coal liquids: coal-liquid stability study. Final report. Hilfman, L. (UOP, Inc., Des Plaines, IL (USA)). Aug 1983. Contract AC22-77ET10131. 244p. NTIS, PC A11/MF A01. Order Number DE83017624.

The storage stability of a freshly processed coal-derived liquid, hydrotreated products therefrom, a petroleum crude and a blend of the coal liquid and petroleum crude oil were evaluated in the Dark Room Storage Fuel Oil Stability Test at 43.3°C (110°F). The thermal stability of the coal liquid was also investigated using the UOP MONIREX Fouling Monitor. The coal liquid was an Exxon Donor Solvent product (i.e., hydrogenated coal liquid) provided from the Exxon Coal Liquefaction Plant. The storage stability was monitored by standard chemical analyses and instrumental analyses which included electron spin resonance (ESR), chemiluminescence (CL), differential scanning calorimetry (DSC) and mass spectrometry (MS). The raw coal liquid exhibited modest changes in properties during 180 days storage at 43.3°C as measured by chemical analyses. Instrumental analyses detected a small amount of reactive species in the coal liquid that underwent rapid changes at ambient temperature and during the first 30 days of storage at 43.3°C. Hydrotreating improved the storage stability of the coal liquid. The coal liquid/petroleum crude oil blend was compatible and possessed satisfactory stability. No adverse effect was predicted on co-processing the blend. The initial process conditions required to hydrotreat the fresh coal liquid and one aged for 90 days at 43.3°C were essentially equivalent. However, analyses of the used catalyst indicated that the catalyst processing the aged coal liquid would deactivate at a faster rate and would ultimately lead to a more severe processing requirement.

56814 (DOE/ET/10679—T19) ESCOE Engineering Program. Quarterly report, July 1, 1983-September 30, 1983. Ksander, Y. (Engineering Societies Commission on Energy, Inc., Washington, DC (USA)). 1983. Contract AC22-77ET10679. 16p. NTIS, PC A02/MF A01. Order Number DE84000997.

The objective of the Liquefaction Technology Data Base (LTDB) is to assist PETC in developing and proof testing the LTDB and in interfacing with the private sector and Engineering Societies for the purpose of achieving the highest validity of and credibility in the LTDB. Effective July 1, ESCOE was authorized to increase the level of effort being applied to the process engineering component of LTDB. ESCOE personnel provided on-site data acquisition support. ESCOE has outlined plans to begin topical multiprocess crosscutting studies using the LTDB resource as soon as the computer-stored data base of SRC-II information is augmented by information from other liquefaction processes (such as H-Coal). To facilitate such studies, an initial version of a computer-readable generalized liquefaction flowsheet was prepared. ESCOE recommends that publicly available FE-numbered topical, quarterly and annual reports on the H-Coal, EDS and SRC-I technologies be processed for entry into the LTDB as soon as possible. This will facilitate the early trials on cross-cut analyses. Review was also performed on the available engineering summaries of SRC-II reports in the LTDB for purposes of quality enhancement and guidance for near-term activities. The purpose of the Advanced Coal Conversion Processes task is to assist PETC in the technical evaluation of experimental facilities.

56815 (DOE/ET/13800—1) Technical assessment of environmental-control technologies for the proposed H-Coal commercial plant. Talib, A.; Gray, D.; Tomlinson, G.; Neuworth, M.; Lytton, M.; Weiss, A. (Mitre Corp., McLean, VA (USA). METREK Div.). Apr 1983. Contract AC01-80ET13800. 368p. (MTR—83-W26). NTIS, PC A16/MF A01. Order Number DE83018030.

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This report presents the results of a technical assessment of the adequacy of selected environmental control technologies for the proposed commercial H-Coal liquefaction plant in Breckinridge County, Kentucky. The expected performance of these technologies for control of liquid, gaseous, and solid effluents was evaluated by using characteristics of the waste streams from Illinois No. 6 (Burning Star) coal generated at the 200-tons-per-day pilot plant at Catlettsburg. The study concludes that the selected environmental-control technologies will permit the proposed commercial plant to convert coal to distillate oil and naphtha while operating within applicable site-specific environmental requirements.

56816 (DOE/ET/14880—T5) Kinetics and mechanism of catalytic hydroprocessing of components of coal-derived liquids. Seventeenth quarterly report, May 16, 1983-August 15, 1983. Gates, B.C.; Olson, J.H.; Schuit, G.C.A.; Stiles, A.B.; Petrakis, L. (Delaware Univ., Newark (USA). Dept. of Chemical Engineering; Gulf Research and Development Co., Pittsburgh, PA (USA)). 20 Sep 1983. Contract AC22-79ET14880. 30p. NTIS, PC A02/MF A01. Order Number DE83018029.

The objective was to establish the reaction network for the catalytic hydroconversion of a simple compound representative of the organic-oxygen compounds in coal liquids, namely 1-naphthol. The catalyst was a typical commercial, sulfided $NiO-MoO_3/\gamma-Al_2O_3$, and experiments were carried out with liquid-phase reactants in a stirred batch reactor under conditions approaching those of practical practice. The results summarized by the network of Figure 3 demonstrate that aromatic ring hydrogenation and direct oxygen extrusion (HDO) occur in parallel, as in the dibenzofuran/H_2 network. The pattern is akin to that observed in catalytic hydroprocessing of organosulfur compounds such as dibenzothiophene and benzo[b]naphtho-[2,3-d]thiophene. The pattern is different from that observed in catalytic hydroprocessing of organonitrogen compounds such as quinoline - in which extensive aromatic ring hydrogenation procedes C-N bond breaking.

56817 (DOE/FE/15067—5-Vol.1) Conceptual IGCC power plant design. Final report, September 16, 1981-December 31, 1982. Volume I. (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 15 Jan 1983. Contract AC21-81FE15067. 300p. NTIS, PC A13/MF A01. Order Number DE84001563.

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This report addresses a specific application for the Gulf States Utilities Company at the Roy S. Nelson site located at Westlake, Louisiana. This application consists of supplying synthetic gas produced from a coal gasification plant for use as fuel for a combustion turbine designated as Nelson Unit No. 7. This unit is intended to be integrated with an existing steam turbine, Nelson Unit No. 4, in a combined cycle mode. The proposed project is based on pressurized, fluidizing bed, coal gasification technology - a domestic technology developed under DOE sponsorship by Westinghouse. The process has been designed for application to power generation equipment. The technology has been successfully demonstrated at the Westinghouse pilot plant at Waltz Mill, Pennsylvania.

The gasification unit has demonstrated the ability to process all types of coal without production of tars and oils, and produces gas with a heating value of approximately 300 Btu/scf. The proposed project builds upon the engineering and technical data available from the existing Nelson Unit No. 4, as well as Nelson Unit No. 7, a nominal 100-MW combustion turbine, capable of combusting coal-derived gas, that was recently placed in operation. The tangible results of this study are presented in this report: physical description in words, diagrams, and drawings of a proposed addition that would convert the GSU Nelson Station into an IGCC power plant; analysis of the financial consequences of making such a conversion; assessment of the availability to be expected from this new type of coal-burning power plant, and suggestions for maximizing that availability; documentation of the baseline environmental situation at the plant and listing of the additional permits deemed to be required in order to implement the recommended program. 48 figures, 51 tables.

56818 **(DOE/FE/15067—5-Vol.2) Conceptual IGCC power plant design. Final report, September 16, 1981-December 31, 1982. Volume II. Appendixes.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 15 Jan 1983. Contract AC21-81FE15067. 219p. NTIS, PC A10/MF A01. Order Number DE84001564.

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Volume II contains appendices for : (1) data sources for reliability study; (2) failure mode and effects analysis for acid gas removal system; (3) reliability study data base (combustion turbine and HRSG system); (4) environmental permitting information; and (5) environmental baseline assessment, Roy S. Nelson Station.

56819 **(DOE/MC/16537—T6) Characterization of high-temperature vapor-phase species and vapor-solid interactions of import to combustion and gasification processes in the energy technologies. Quarterly technical progress report No. 7, 14 April-15 July 1983.** Gole, J.L. (Georgia Inst. of Tech., Atlanta (USA). School of Chemistry). 15 Jul 1983. Contract AC21-81MC16537. 20p. NTIS, PC A02/MF A01. Order Number DE83015166.

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This report summarizes work completed during the seventh quarter of a two-year study focused primarily on the determination of bond energies and spectra for the alkali hydroxides and oxides, the study of pronounced particulate matter formed in alkali oxidation, and the characterization of sodium cluster and sodium surface oxidation with various oxidants. We have developed and are continuing to improve experimental configurations for generating intense, stable, and long-lasting chemiluminescent emission from the alkali hydroxides NaOH and KOH and the alkali oxides NaO and KO. The first electronic emission spectra for these compounds have been generated and are being studied in our laboratory. Commensurate with this effort has been the study of extensive particulate formation which appears to be pathological to the alkali hydroxide and oxide systems. This particulate matter, formed in an extremely efficient manner in the oxidation process, has been studied using a number of techniques (low temperature mass spectrometry, EPR spectrometry, and Raman spectroscopy). Initial efforts to obtain an x-ray powder pattern and a high temperature quadrupole mass spectrum have been instituted. Sodium cluster oxidation studies over the past three month period have focused on the desire to observe emission from highly exothermic processes which characterize the Na/sub x/-SO_2-Cl_2 system. In addition, refinements of studies of silicon monoxide formation which complement previous studies under DOE sponsorship were carried out during this period. From these studies the bond energy of SiO was confirmed from a purely spectroscopic measurement thus complementing and confirming the mass spectrometric determinations. 3 figures.

56820 **(DOE/MC/19122—10) Advanced development of a pressurized ash agglomerating fluidized-bed coal gasification system. Seventh monthly progress report, August 1982.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 20 Oct 1982. Contract AC21-82MC19122. 15p. NTIS, PC A02/MF A01. Order Number DE84000870.

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Progress reports are presented for August for the following areas of study: process development units (PDU) operations and results; process and component engineering and design; cold flow scaleup facility (CFSF); laboratory support studies. Some of the highlights for this period are: PDU tests, TP-033-1, were conducted using Brookville seam coal and North Dakota lignite as the feedstocks; design and procurement activities for the October hot fines recycle test continued; TP-M005, the CFSF shakedown test on the new air tube configuration, was completed; TP-M007-1, a carbon dioxide tracer gas test, was initiated; laboratory support studies included gas-solids flow modeling and coal-ash studies.

56821 **(DOE/MC/19122—13) Advanced development of a pressurized ash agglomerating fluidized-bed coal gasification system. Ninth monthly progress report, October 1982.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 12 Nov 1982. Contract AC21-82MC19122. 10p. NTIS, PC A02/MF A01. Order Number DE84000873.

Progress reports are presented for the following tasks: process development units (PDU) operations and results; process and component engineering and design; process analysis; cold flow scaleup facility (CFSF); and laboratory support studies. In addition, work forecast for the next report period is presented. Some of the highlights for this period are: mechanical work, commissioning and startup activities were conducted in October in preparation for TP-033-2, a hot fines recycle test with a non-mechanical feed control device in the primary system; environmental characterization data obtained during 1982 PDU tests were compiled and evaluated; work was conducted in the areas of gas-solids flow modeling and coal/ash behavior; CFSF test TP-M-007-1 with the 10-inch diameter oxidant tube continued during October.

56822 **(DOE/MC/19122—14) Advanced development of a pressurized ash agglomerating fluidized-bed coal gasification system. Tenth monthly progress report, November 1982.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 14 Dec 1982. Contract AC21-82MC19122. 16p. NTIS, PC A02/MF A01. Order Number DE84000867.

Accomplishments for the month of November are presented for the following tasks: process development unit (PDU) test operations and results; process and component engineering and design; process analysis; cold flow scaleup facility (CFSF); laboratory support studies. Some of the highlights are: single-stage, oxygen-blown test TP-033-2 was conducted from October 21 to November 22 using Wyoming Sub-C and Western Kentucky No. 9 coals as the feedstocks; construction activities for TP-033-2 were completed and commissioning activities were finalized; operational analysis of the PDU non-mechanical valve performance during the November test, TP-033-2, was conducted; CFSF test TP-M007-1 with the 10-inch diameter oxidant tube was completed; laboratory studies were conducted in the areas of gas-solids flow modeling and coal/ash behavior.

56823 **(DOE/MC/19122—15) Advanced development of a pressurized ash agglomerating fluidized-bed coal gasification system. Eleventh monthly progress report, December 1982.** (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 31 Jan 1983. Contract AC21-82MC19122. 14p. NTIS, PC A02/MF A01. Order Number DE84000868.

Progress for the month of December are presented for the following tasks: process development unit (PDU) operations and results; process and component engineering and design; cold flow scaleup facility (CFSF); laboratory support studies. Some highlights for this period are: the final test in the 1982 PDU test program, TP-033-3, was conducted using Kentucky No. 9 coal as the feedstock; a number of modifications and changes were implemented prior to startup of gasifier test TP-033-3; CFSF pneumatic solids transport loop test FR-002 was initiated; laboratory tests were conducted in the areas of gas-solids flow modeling and coal/ash behavior.

56824 (DOE/MC/19122—18) Advanced development of a pressurized ash agglomerating fluidized-bed coal-gasification system. Twelfth monthly progress report, January 1983. (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 14 Feb 1983. Contract AC21-82MC19122. 11p. NTIS, PC A02/MF A01. Order Number DE84000878.

Progress reports for the month of January for the following tasks are presented: process development unit (PDU) operations and results; process and component engineering and design; cold flow scaleup facility (CFSC); laboratory support studies. Some of the highlights are: PDU was shut down for scheduled maintenance and modifications; based on the results of review of data from PDU tests TP-033-3 and TP-033-4, hardware and procedural modifications will be made; working sessions have been held for the Process Analysis task which will lead to the compilation of a design manual for the pressurized ash agglomerative fluidized-bed process; CFSF test FR-002 on the Solids Transport Line was completed; laboratory studies continued in the areas of gas-solids flow modeling and coal/ash behavior.

56825 (DOE/MC/19122—20) Advanced development of a pressurized ash-agglomerating fluidized-bed coal-gasification system. Thirteenth monthly progress report, February 1983. Schmidt, D.K.; Keairns, D.L. (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 16 Mar 1983. Contract AC21-82MC19122. 10p. NTIS, PC A02/MF A01. Order Number DE84000879.

Progress reports are presented for the following tasks: process development units (PDU) test operations and results; process and component engineering and design; cold flow scaleup facility (CFSF); laboratory support studies. Some of the accomplishments are: scheduled activities for the annual PDU maintenance program were completed for the mid-March PDU startup; modifications to the PDU continued, and with the exception of the high-speed centrifugal pump, will be completed before startup; modifications required to upgrade the PDU for improved operation included addition of a blowdown system for Solids Injection Device (SID), change in the orientation of the nozzles for pressure taps, and relocation of the K-ray for level control; CFSF test data for the pneumatic transport test FR-002 has been completed; laboratory studies continued in the areas of gas-solids flow-modeling and coal/ash behavior.

56826 (DOE/MC/19122—21) Advanced development of a pressurized ash agglomerating fluidized-bed coal-gasification system. Fourteenth monthly progress report, March 1983. (Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.). 20 Apr 1983. Contract AC21-82MC19122. 9p. NTIS, PC A02/MF A01. Order Number DE84000874.

Accomplishments for March are presented in the following areas: process development unit (PDU) test operations and results; process and component engineering and design; cold flow scaleup facility (CFSF); laboratory support studies. Some of the highlights are: all major modifications in preparation for PDU test TP-034-1 were completed and testing was initiated using Wyoming coal as the feedstock; in preparation for test TP-034-1, design and construction orders were completed for SID blowdown system, pressure tap reorientation, K-ray level control relocation, and cyclone refractory recast; TP-M009-1, a test to measure bubble frequency and solid circulation flux, was completed; laboratory studies continued in the areas of gas-solids flow modeling and coal-ash behavior.

56827 (DOE/NASA/13111—15) Summary of synfuel characterization and combustion studies. Schultz, D.F. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Aug 1983. Contract AI21-77ET13111. 56p. (NASA-TM—83066). NTIS, PC A04/MF A01. Order Number DE84000245.

Combustion research studies aimed at evolving environmentally acceptable approaches for burning coal-derived fuels for ground power applications were performed. A literature survey was conducted to determine the properties of synthetic fuels. Coal liquids were found to have lower percent hydrogen and lower viscosities than petroleum fuels when looking at similar percent distillation ranges. Synthetic gases trend to fall into two general categories nominally called low-Btu gas and medium-Btu gas. Low-Btu gases were usually produced in air-blown gasifiers and had enough contents of 70 to 132 kJ/mole, while medium-Btu gases were usually produced in oxygen-blown gasifiers and had energy contents of 219 to 307 kJ/mole. A computer modeling effort produced results with very good agreement on NO/sub x/ and fair agreement with CO emissions compared to test results in a flame tube rig. Flame tube experiments demonstrated that the rich burn equivalence ratio, which produced minimum NO/sub x/ when burning fuels containing fuel bound nitrogen, was a function of both the percent hydrogen and nitrogen in the fuel. Sector rig testing was performing to demonstrate the ability of variable combustor geometry to control equivalence ratios in each combustor zone (primary, secondary, and tertiary) regardless of operating conditions, as well as to demonstrate the ability of steam cooling to enhance rich-burn combustor liner durability. Three degrees of variable geomtery were incorporated into the combustor, one for each combustor zone. The variable geometry was remotely actuated and performed flawlessly. Valve positions were easily obtained and were repeatable. The steam cooling performed well, enhancing rich-lean primary zone durability and demonstrated the ability of the primary zone liner to be used as a steam superheater.

56828 (DOE/PC/39991—T1) Coal-liquefaction technologies and the PMN process. Final report. (Enviro Control, Inc., Rockville, MD (USA)). Sep 1981. Contract AC22-80PC39991. 350p. NTIS, PC A15/MF A01. Order Number DE83017833.

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Enviro Control, Inc. was asked to determine the toxicological testing required for synfuels from coal liquefaction processes to comply with the premanufacturing notification (PMN) program of the US Environmental Protection Agency (EPA) under the Toxic Substance Control Act (TSCA). This report constitutes the final report under this contract. A discussion of the PMN process, the status of the 422 PMN's submitted to EPA to date, and the status of synfuels in the PMN process are presented. An overview of other relevant state and local laws regarding substances has also been included. The coal liquefaction technologies being considered are Solvent Refined Coal (SRC) I, SRC II, H-Coal, and Exxon Donor Solvent. These are the technologies closest to commercialization and those for which PMNs will most likely be required. An important step in determining toxicological tests that may be required under TSCA is to identify the substances and mixtures produced by each of the above technologies. A toxicological testing scheme that reflects the level of detail likely to be required by EPA for a synfuel-related PMN is presented. Criteria based on exposure estimates and the results of previous tests have been recommended for use in deciding when additional data are needed. Short descriptions of each test method, including an indication of cost and time required to perform it, are included. Finally, a survey of toxicological laboratories and an assessment of their capabilities regarding the recommended testing protocol is included.

56829 (EGG-M—00483) Sulfidation characteristics of Incoloy 800. Smolik, G.R.; Miley, D.V. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 17p. (CONF-830759—2). NTIS, PC A02/MF A01. Order Number DE84000898.

From 16. annual technical meeting of the International Metallographic Society; Calgary, Canada (25 Jul 1983).

The corrosion behavior of Incoloy 800 has been investigated at temperatures and oxygen and sulfur potentials representative of coal gasification processes. The corrosion coupons had carbon contents and grain sizes representing the range of values available for Incoloy 800. The coupons were examined by optical metallography and scanning electron microscopy. 11 references, 5 figures, 1 table.

56830 (LBL—15936) Homogeneous catalytic hydrogenation: regiospecific reductions of model coal compounds containing a nitrogen heterocyclic ring. Fish, R.H.; Cremer, G.A.; Thormodsen, A.D. (Lawrence Berkeley Lab., CA (USA)). Mar 1983. Contract AC03-76SF00098. 10p. (CONF-830807—13). NTIS, PC A02/MF A01. Order Number DE84001079.

From International conference on coal science; Pittsburgh, PA, USA (15 Aug 1983).

A research program was established to find transition-metal catalysts that will regioselectively reduce the heterocyclic ring in polynuclear heteroaromatic nitrogen compounds. Some of the findings are: (1) quinoline, acridine, benzoquinolines and phenanthridine which are found in coal and coal liquids, can be selectively reduced under various homogeneous hydrogenation conditions, i.e., water gas shift (wgs), synthesis gas (sg) and hydrogerc alone using transition metal hydrides as catalysts; (2) Wilkinson's catalyst, $[(C_6H_5)_3P]_3$ RhCl can selectively reduce quinoline, 5,6- and 7,8-benzoquinoline, acridine and phenanthridine under mild conditions in nearly quantitative yields; (3) 9,10-dihydrophenanthridine can act as a hydrogen donor only in the presence of rhodium and ruthenium catalysts.

56831 (LBL—15985) Selective catalytic hydrogenation of polynuclear heteroaromatic nitrogen compounds with polymer-supported transition-metal compounds. Fish, R.H.; Heinemann, H. (Lawrence Berkeley Lab., CA (USA)). Jul 1983. Contract AC03-76SF00098. 10p. (CONF-830549—2). NTIS, PC A02/MF A01. Order Number DE84001326.

From 7. annual EPRI contractors' conference on coal liquefaction; Palo Alto, CA, USA (11 May 1983).

The selective catalytic hydrogenation of model coal compounds such as quinoline, 5,6- and 7,8-benzoquinoline, acridine and phenanthridine were studied using transition metal catalysts supported on 2% or 20% cross-linked phosphinated divinylbenzene-polystyrene beads. In all cases, only the nitrogen heterocyclic ring in the above-mentioned polynuclear heteroaromatic nitrogen compounds was reduced, while it was found that the 2% cross-linked beads were three times more active per metal atom than their 20% cross-linked analogues and forty times more active than its homogeneous counterpart using quinoline as the model coal compound and polymer-supported Wilkinson's catalyst. A discussion of these results are presented along with data to show; clearly, the potential of these polymer-supported catalysts in the selective reduction of polynuclear heteroaromatic nitrogen compounds in the presence of known coal liquid constituents such as pyrene, tetralin, methylnaphthalenes, cresols and 2-methylpyridine.

56832 (N—8321505) Oxygen supply for coal gasification power stations (combined cycle process). Final Report, Feb. 1981. Rottmann, D.; Schoenpflug, E. (Linde A.G., Hoellriegelskreuth (Germany, F.R.)). Feb 1982. 75p. (In German). (BMFT-FB-T—82-018). NTIS, PC A04/MF A01.

Adaptation of air separation processes to coal gasification plants was investigated. Main points are the start up and the load change behavior of the total process. Air separation processes which put at disposal oxygen most energetically to the combined cycle process are estimated. The technical feasibility of such a plant is checked. The load change behavior of the plant, the adaptation of the coal gasification and the start up of the total system are investigated. The influence of process parameters on the energy consumption is calculated. The most economical air separation processes are investigated. It is found that a low pressure plant with mixed heat exchangers and a medium pressure plant with molsieves are the most economical processes and that air separation processes and the order of magnitude can be constructed economically.

56833 (NMERDI—2-71-4607) Comparative evaluation of coal conversion technologies. Final report, December 7, 1982-July 6, 1983. Robinson, C.W. (Energy Transition Corp., Santa Fe, NM (USA)). Sep 1983. 267p. New Mexico Energy Research and Development Institute, 117 Richmond Drive NE, Albuquerque, NM 87106.

A comparative evaluation was made of six coal pyrolysis processes developed by the following companies: Davy McKee (COCHAR), Exxon (Exxon Donor Solvent), Lurgi (Lurgi Ruhrgas), Occidental Research Corporation (Flash Pyrolysis), Tosco (TOSCOAL), Union Carbide (Hydrocarbonization). This study serves as the necessary first step to the development of a major coal pyrolysis plant based on San Juan Basin coal. The process evaluation led to the recommendation that a more detailed study be made of the integration of the Union Carbide Hydrocarbonization process with an existing coal-fired electric utility plant in the Four Corners. The study included investigations of a char/coal liquids slurry movement to Texas or California, of the hydrotreating of coal liquids produced by the Hydrocarbonization process, and of the cleaning of San Juan Basin coal by electrostatic separation. Estimates of the capital and operating costs of a Hydrocarbonization plant located adjacent to the Four Corners Power Plant were prepared. A forecast was made of the economic benefits to the state of New Mexico and the number of jobs which would be created by the construction of a hydrocarbonization plant. A work plan was created to guide the project through the next stage of development. 58 references, 1 figure, 5 tables.

56834 (NYSERDA—83-11) Effect of vaporizing and premixing of SRC II fuel on its combustion quality. Final report. Zakkay, V.; Agnone, A.; Clisset, H. (New York Univ., Westbury, NY (USA). Antonio Ferri Labs.). Jul 1982. 41p. NTIS, PC A03/MF A01. Order Number DE84900177.

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The experimental results of vaporized and premixed combustion of Solvent Refined Coal (SRC II) fuel oil in a residential-scale burner are reported. The burner was developed initially at the New York University Antonio Ferri Laboratories for the vaporized combustion of No. 2 fuel oil. The vaporization technique consists of spraying SRC II fuel onto a recouperatively heated surface and premixing the vapor with partially heated air. The burner design, controls and instrumentation are described in the report. The flow and geometric parameters were varied to assess the effects of air preheat temperature, vaporization surface temperature, degree of atomization and degree of mixing on complete combustion and efficiency. The former is evaluated mainly from the analysis of the flue gas content of nitric oxide and smoke. The carbon dioxide, carbon monoxide and oxygen present in the flue gases were also measured to determine the stoichiometry of the combustion process. The efficiency of the combustion process was measured using both a calorimeter and stack technique. The experimental results show that vaporized combustion of SRC II can yield high combustion quality with 16.3% CO_2, 200 ppM CO, and 0.6% O_2 corresponding to less than 3% excess air while still maintaining low smoke levels. However, due to the high flame temperature corresponding to the reduced excess air requirements, and due to the nitrogen content of the fuel, the nitric oxide emissions are excessively high (~ 900 ppM NO). A two stage combustion process in which the first stage operates as a fuel rich (phi = 1.9) vaporizing burner as described here is recommended to reduce the nitric oxide emissions.

56835 (ORNL/ENG/TM—29) Summary of selected H-Coal reactor thermal-fatigue studies. Huxtable, W.P. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 94p. NTIS, PC A05/MF A01. Order Number DE84001489.

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Thermal fatigue life of large high-pressure coal liquefaction vessels is a prime factor in the safety and economics of coal conversion facilities. To ensure the successful operation of the reactor vessel in the H-Coal Pilot Plant engineering analysis of thermal fatigue was provided from 1978 to 1983. This analysis and subsequent monitoring during operations was due in large part to the specific mechanical design of the vessel. An independent review of the vessel manufacturer's reports indicated an unrecognized approach for estimating vessel fatigue life. A creep-fatigue evaluation by UCC-ND based on ASME Code Case N-47 indicated that the vessel could be operated safely over its planned two-year life. The H-Coal reactor was designed in accordance with ASME Section VIII, Division 2, Paragraph 160.2 rules, which specify that the life of the vessel is expended when the sum of pressure cycles and equivalent thermal fatigue (ETF) cycles exceeds 1000. Simulation of vessel thermal response to hypothetical process temperature transients was valuable for comparing temperature monitoring strategies for measuring ETF cycles prior to actual vessel operation. The grid support region most rapidly accumulates ETF cycles in the H-Coal vessel due to its method of attachment to the vessel wall. These analytical studies led to the recommendation that metal rather than process temperatures be used to reduce the accumulation of ETF cycles in the grid support region. Additional thermocouples were installed on the grid support, and the resulting data allowed a 28% reduction in ETF cycles. Significant circumferential

variation in ETF cycles was observed in the H-Coal vessel grid support region, suggesting a need for careful fluid dynamic design. Local reaction hot spots which occur above the grid plate were not found to significantly affect ETF cycles in the grid support region if the reactor refractory liner remains intact.

56836 **(ORNL/FMP—83-3) Fossil-Energy-Materials Program. Quarterly progress report for the period ending June 30, 1983.** (Oak Ridge National Lab., TN (USA)). Aug 1983. Contract W-7405-ENG-26. 471p. NTIS, PC A20/MF A01. Order Number DE84000646.

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The objective of the AR and TD Fossil Energy Materials Program is to conduct research and development on materials for fossil energy applications with a focus on the longer-term and generic needs of the various fossil fuel technologies. The program includes research aimed toward a better understanding of materials behavior in fossil energy environments and the development of new materials capable of substantial enhancement of plant operations and reliability. The management of the Program has been decentralized to DOE Oak Ridge Operations office (ORO) and the Oak Ridge National Laboratory (ORNL) as technical support contractor. The ORNL Fossil Energy Materials Program Office compiles and issues this combined quarterly progress report from camera-ready copies submitted by each of the participating subcontractor organizations. This report of activities on the program is organized in accordance with a work breakdown structure defined in the AR and TD Fossil Energy Materials Program Plan for FYs 1982-86 in which projects are organized according to fossil energy technologies. We hope this series of AR and TD Fossil Energy Materials Program quarterly progress reports will aid in the dissemination of information developed on the program.

56837 **Role of cholorine in corrosion of liquefaction plant fractionators.** Keiser, J.R.; Judkins, R.R. (Oak Ridge National Lab., TN). *Materials and Components in Fossil Energy Applications;* **44**: 1-6(1 Jun 1983). Contract W-7405-ENG-26.

Severe corrosion in the fractionation columns of four coal liquefaction pilot plants has been studied intensively. Amine hydrochlorides have been found to play a crucial role in the corrosion, and the specific amines have been identified. A corrosion mechanism has been proposed, materials with adequate corrosion resistance have been identified, and chloride removal methods based on the properties of amine hydrochlorides have been suggested. (JMT)

56838 **Kinetics of rapid pyrolysis and hydropyrolysis of a sub-bituminous coal.** Doolan, K.R. (Univ. of Sydney, Australia); Mackie, J.C.; Mulcahy, M.F.R.; Tyler, R.J. *Symposium (International) on Combustion,* [*Proceedings*]; 1131-1138(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Coal pyrolysis in both argon and hydrogen atmospheres has been investigated in the temperature range 1100 to 2300 K using a shock tube. Particles of size <10 μm diameter were studied. Particle heating rates of 10^7 Ks^{-1} were achieved giving particle heating times of $<\sim 150$ μs. This high rate of heating enabled the devolatilisation kinetics to be decoupled from particle heat-up effects. Particle cooling rates due to the rarefraction wave in the shock tube were 5×10^6 Ks^{-1}. Residence times ranged from 0.25 to 1.3 ms and total pressures from 17 to 35 atmospheres. C_1 to C_7 hydrocarbons and benzene, toluene and xylene yields were determined for pyrolysis in both argon and hydrogen/inert gas mixtures. Major gaseous products included CH_4, C_2H_4, C_6H_6, l, 3-butadiene and benzene. C_2H_2 only became important at temperatures above 1500 K and was attributed to secondary gas phase decomposition of the volatilised species. In the presence of hydrogen the major effect observed was an increase in the yields of CH_4 and C_6H_6. C_2H_2 yields were markedly lower in H_2. The results were fitted by a first order evolution and secondary decomposition model which included equations to allow for particle heatup and quench. The model enabled kinetic parameters for volatile species evolution and decomposition to be evaluated. The implications of these results to coal pyrolysis are discussed.

56839 **Coal thermal decomposition in an entrained flow reactor: experiments and theory.** Solomon, P.R.; Hamblen, D.G.; Carangelo, R.M.; Krause, J.L. (Advanced Fuel Research, Inc., East Hartford, CT). *Symposium (International) on Combustion,* [*Proceedings*]; 1139-1149(1982). (CONF-820801—). Contract AC21-81FE05122.

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Results from the entrained flow reactor experiments indicate the FT-IR is an excellent way to measure gas evolution (including in-situ measurements of species and temperature) and functional group changes in the reactants. The measurements have yielded additional evidence that coal pyrolysis kinetics are insensitive to coal rank. Good agreement between theory and experiment have been obtained using a set of distributed kinetic rates which fit experiments differing substantially in configuration, temperature and reaction time.

56840 **Parametric investigation of tar release in coal devolatilization.** Freihaut, J.D.; Zabielski, M.F.; Seery, D.J. (United Technologies Research Center, East Hartford, CT). *Symposium (International) on Combustion,* [*Proceedings*]; 1159-1167(1982). (CONF-820801—). Contract AC21-81MC16221.

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A parametric investigation of the effects of coal characteristics and devolatilization conditions on the tar component of volatile matter has been performed. A heated grid apparatus is employed with programmed heating rates of $\sim 10^2$-10^3 C/sec to final temperatures of 500 to 1500 C. Fourteen different coals were utilized in the investigation, ranging from lignite to anthracite. The maximum tar fraction of the total volatile yield is a function of the chemical characteristics of the parent coal, amounting to ~20% of the total volatile yield for a lignite to ~80% for a medium volatile bituminous coal. The sensitivity of tar yields to changes in devolatilization conditions is also observed to be a function of coal charactersitics. Tar formation and release is observed to be endothermic and to perturb the temperature of the grid in immediate contact with the sample. The fuel nitrogen in the parent coal is distributed proportional in the pyrolysis products. Specifically, the mass fraction of fuel nitrogen in the tars is similar to the mass fraction of the parent coal that evolves as tar. Tar yields are reduced with increases in ambient pressure in the 10^{-3} to 760 torr range, with greatest reductions occurring in the 10^{-3} to 200 torr range. The higher oressures increase the secondary reactions of the tars resulting in an increase in light hydrocarbons in the gaseous products. Models of coal devolatilization therefore must explicitly include tar evolution and its dependence on coal characteristics, heating rate and pressure. A model should also deal with the endothermicity of the tar release process.

56841 **Mechanism and control of coal liquefaction fractionation column corrosion.** Keiser, J.R. (Oak Ridge National Lab., TN); Judkins, R.R.; Baylor, V.B.; Canfield, D.R. pp 13p, Paper 151 of Corrosion/82. Houston, TX; National Association of Corrosion Engineers (1982). (CONF-820314—). Contract W-7405-ENG-26.

From National Association of Corrosion Engineers conference; Houston, TX, USA (22 Mar 1982).

Severe corrosion has been encountered in fractionation columns at the solvent refined coal (SRC) pilot plants in Fort Lewis, Washington, and Wilsonville, Alabama, the H-Coal pilot plant in Catlettsburg, Kentucky, and the Exxon Donor Solvent pilot plant in Baytown, Texas. Corrosion rates as high as 25 mm/y (1 in./y) on carbon steel and 6.4 mm/y (250 mils/y) on 18-8 stainless steels have been measured in the most severely corroded portions of the columns. Less severe corrosion is generally found at locations above and below this limited region of maximum corrosion. The severity of this corrosion appears to be related to the chlorine content of the coal. Studies of this corrosion problem by Oak Ridge National Laboratory (ORNL) personnel included exposure of corrosion coupons in the pilot plant columns, analyses of liquids collected at the pilot plants, and performance of laboratory experiments. As a result of this work, we can specify alloys with adequate corrosion resistance for construction of fractionation columns, identify the chlorine-

bearing compounds, and propose chlorine transport and corrosion mechanisms.

56842 Considerations in welding for corrosive coal liquefaction service. Baylor, V.B.; Keiser, J.R.; Edmonds, D.P. (Oak Ridge National Lab., TN). pp 14p, Paper 193 of Corrosion/82. Houston, TX; National Association of Corrosion Engineers (1982). (CONF-820314—). Contract W-7405-ENG-26.

From National Association of Corrosion Engineers conference; Houston, TX, USA (22 Mar 1982).

Synthetic fuels can be produced by liquefaction of coal as demonstrated by operating pilot plants. Commercialization of these processes, however, requires reliable materials performance. The materials selection data base derives largely from petroleum refinery experience because of the similarity between the two technologies. Unexpected failures have occurred, however, and these failures warrant careful investigation. Austenitic stainless steels necessary for resistance to sulfur and organic acids failed by stress corrosion cracking and by general and localized surface attack. These failures were attributed to polythionic acids and chlorides, many occurring in or adjacent to weldments. Other types of failures relating to weldments and weld overlays will also be described. The differences and similarities between the petroleum refinery and coal liquefaction technologies are addressed as they relate specifically to welding. Current research projects aimed at improving weldability of materials in coal liquefaction systems are also discussed in relation to increasing plant reliability.

56843 Fuel slurry consisting of pulverized coal, water and a dispersant; and a method to produce this slurry. Siwersson, O.L.; Loodberg, J.Aa.; Wall, A.E. (to AB Scaniainventor, Goeteborg (Sweden)). Swedish Patent 7,805,632-2/B/. 17 May 1978. 11p. (In Swedish).

A coal-water slurry is described consisting of 55-80 percent finely ground coal, water and 0.02-4 percent dispersant; with a pH-value of 7-10. As dispersant, an alkali or ammonium salt of a polycarboxylic acid is used. A method to produce this slurry and to eliminate impurities through sedimentation, electric or magnetic separation and (or) flotation is also described.

56844 Method for wet carbonization of peat. Myreen, B. Swedish Patent 7,803,376-8/B/. 23 Mar 1978. 8p. (In Swedish).

According to this principle for wet carbonization of peat, an efficient flue gas purification is combined with product and waste heat utilization in the process. The peat is first watered and strained. The raw peat suspension is then preheated in heat exchangers and in at least one preheating tower. In the pressurized carbonization reactor, steam is added, and the reaction takes place at about 200 degreeC. In the reaction, carbon dioxide, water and certain organic compounds are separated from the solid content of suspension. The carbon concentration of the solid content is increased and the gel structure is destroyed, which makes it possible to later dewater the suspension by filtering and pressing. The suspension is then cooled in the preheating tower, mechanically dewatered and finally dryed with the hot flue gases from the steam boiler. The product obtained, i.e. dry wet-carbonized peat is directly used as a fuel or further processed to e.g. peat coke.

0106 Properties

REFER ALSO TO CITATION(S) 56819, 56827, 56869

56845 (DOE/PETC/TR—84/1) Development of an analytical method for the determination of organic compounds in fossil-fuel aqueous leachates. White, C.M.; Avery, M.; Blanton, W.; Hilpert, L.; Jackson, L.; Junk, G.; Maskarinec, M.; Paule, R.C.; Raphaelian, L.; Richard, J. (USDOE Pittsburgh Energy Technology Center, PA). Oct 1983. 81p. NTIS, PC A05/MF A01. Order Number DE84001332.

An analytical method has been developed for analysis of organic compounds in aqueous leachates of fossil fuel solid wastes. The method has been evaluated using two synthetic leachates as well as bulk and small-scale leachates of SRC-II vacuum still bottoms at the participating laboratories. Under the conditions of these tests, the method worked well for most analytes; however, n-hexanoic acid, 4-aminobiphenyl, 1,4-naphtoquinone, and 1-nephthylamine were not determined accurately or precisely by the method. Other analytes of interest are benzanthracene, o-cresol, phenanthrene, carbazole, naphthalene, phenol, n-tetradecane, 2-naphthol, dibenzothiophene, quinoline, acenaphthylene, 2-picoline, fluoranthrene, 2,3,4,5-tetrachlorobiphenyl (standard), 2-fluorophenol (standard), n-octacosane (standard), and azulene (standard). 7 references, 22 figures, 26 tables.

56846 (ECN—83-095) Coal minerals analysis by a programmed SEM-EDS. Data presentation and reproducibility of results. Vleeskens, J.M.; Hamburg, G. (Stichting Energieonderzoek Centrum Nederland, Petten). Jun 1983. 17p. ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

Coal minerals analysis is a service given by ECN (Stichting Energieonderzoek Centrum Nederland, Postbus 1, 1755 ZG Petten, Netherlands, tel. 02246-4949, telex 57211) to research and development projects. CMA can be done too on request for others. The analysis is performed by means of a programmed SEM-EDS unit. SEM stands for scanning electron microscopy, EDS stands for energy dispersive system. The limits of confidence of the analysis were investigated and presented in tabular and graphical form. For the reader's convenience the results are preceded by a short description of the method and the mode of data presentation. (2 graphs, 4 tables).

56847 (N—8322761) Summary of recommendations on basic research. (University of South Florida, St. Petersburg (USA)). Jan 1982. 8p. NTIS, PC A07/MF A01.

In Workshop Rept. on Basic Res. in Org. Geochem. Appl. to Natl. Energy Needs, p 1-8 (SEE N83-22760 12-44).

There has been considerable progress during the past four decades in organic geochemistry research applied to understanding the origin of coal, oil, and gas, and in understanding contemporary and ancient carbon cycles on Earth. Significant contributions have been made by academic research, government laboratories, and industrial research communities either working independently or with informal cooperation. But, important questions still remain. Among the questions answered in this paper are those dealing with the mechanisms of migration of hydrocarbons and the structure of kerogen and coal. During the final plenary session of the workshop, one way of dealing with the problem of coordinating basic research effects between industry, academic institutions, and government laboratories, strongly favored by some of the participants, was discussed--creation of a National Fossil Fuel Research Institute.

56848 (N—8322763) Exploitation deliberations. Castano, J.R. (Shell Development Co., Houston, TX (USA)). Jan 1982. 4p. NTIS, PC A07/MF A01.

In Univ. of South Florida Workshop Rept. on Basic Res. in Org. Geochem. Appl. to Natl. Energy Needs, p 17-20 (SEE N83-22760 12-44).

Responsible exploitation of our natural carbonaceous fuels must necessarily be founded in basic organic geochemical research. The greatest impact could be made by directing basic research towards three important areas: (1) the chemical structure of coal (2) the non-thermal recovery of oil from heavy oil sands and (3) the utilization of soil shale. These research areas are discussed in detail.

56849 Pore tree structure of porous char. Simons, G.A. (Physical Sciences, Inc., Andover, MA). *Symposium (International) on Combustion, [Proceedings]*; 1067-1076(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A theory is presented which describes the tree-like pore structure of carbon char. Each pore that reaches the exterior surface of a char particle is depicted as the trunk of a tree. A statistically derived and empirically verified pore distribution function specifies the size distribution of the tree trunks on the particle surface. A continuous branching description of the pore tree predicts the number and size of the pores as a function of the skewed distance into the pore tree. The pore structure is completely specified through measured values of the porosity θ, internal surface area $s/$

sub p/, and the particle radius a. The oxidation rate of carbon char is shown to be sensitive to the structure of the pore tree and the present theory is shown to accurately model the oxidation data base.

0108 Waste Management

REFER ALSO TO CITATION(S) 57523, 57524, 57526

0109 Environmental Aspects

REFER ALSO TO CITATION(S) 56815, 56818, 56861, 56862, 56863, 57632

56850 **(ANL/EES-TM—226) Energy and Environmental Systems Division 1968 to 1983 publications.** (Argonne National Lab., IL (USA)). May 1983. Contract W-31-109-ENG-38. 53p. NTIS, PC A04/MF A01. Order Number DE84000909.

This bibliography lists the books, journal articles, conference papers, and technical reports produced by the Energy and Environmental Systems Division of Argonne National Laboratory. They are categorized into the areas of fossil energy resources and technologies, renewable energy resources and technologies, energy-efficient technology, electric utilities, systems analysis, and natural resources management. (ACR)

56851 **(N—8322764) Environmental impact deliberations.** Farrington, J.W. (Woods Hole Oceanographic Institution, MA (USA)). Jan 1982. 12p. NTIS, PC A07/MF A01.

In Univ. of South Florida Workshop Rept. on Basic Res. in Org. Geochem. Appl. to Natl. Energy Needs, p 21-32 (SEE N83-22760 12-44).

Many of the known and potential chemical pollutants released to the environment during the various phases of exploration, exploitation, and use of energy resources are organic chemicals. A complex variety of naturally occurring organic compounds are also a key part of the carbon cycle in the contemporary environment. Understanding the response of the global carbon cycle to CO2 increases in the atmosphere from fossil fuel combustion will depend, in part, on understanding the organic matter in the carbon cycle. Early in the deliberations it was concluded that the present goals of organic geochemistry research in area of environmental impacts are: (1) to provide knowledge of the important factors in the critical pathways of pollutants to man and living, natural resources and (2) to provide a better understanding of the biogeochemical cycles of carbon and other elements. An important recurrent theme throughout the deliberations was the recognition that much of the environmental impact research needed in organic geochemistry was the same or similar in fundamental approach to that needed for inorganic chemicals.

56852 **(USGS-OFR—80-764) Procedure for predicting concentrations of dissolved solids and sulfate ion in streams draining areas strip mined for coal.** Bevans, H.E. (Kansas Geological Survey, Lawrence (USA)). Aug 1980. 17p. US Geological Survey-WRD, 1950 Avenue A, Campus West, University of Kansas, Lawrence, KD 66045.

Current trends in increased coal production necessitate the development of techniques to appraise the environmental degradation that results from strip mining. A procedure is introduced for the prediction of dissolved-solids and sulfate-ion concentrations in streams draining strip-mined areas as functions of the percentage of the drainage area that has been strip mined. These relationships are expressed by regression equations computed from data collected in streams draining strip-mined areas of Cherokee and Crawford Counties in southeast Kansas. 15 references, 8 figures, 2 tables.

56853 **Palynological investigations of late Pleistocene deposits in southeastern France.** Gremmen, W.H.E. Groningen, Netherlands; Rijksuniversiteit Groningen (1982). 114p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (NL).

Palynological investigations were carried out on lignites and other Late Pleistocene deposits in the area north of Grenoble in southeastern France, in order to reconstruct the vegetational and climatic development in this area during the Late Pleistocene. The ^{14}C and ionium content of several lignites were also measured.

56854 **Kulkonsekvensundersoegelse. Luftforureningsmaessige konsekvenser af kulfyring paa danske kraftvaerker. Delrapport, saet 2. Miljoeeffekter som foelge af en oeget kulanvendelse i energiproduktionen 1 og 2. (Investigation on the consequences of coal combustion. Consequences of air pollution from coal combustion in Danish power plants. Part report 2. Environmental effects due to increased coal use in power production 1 and 2).** Pilegaard, K. Soeborg, Denmark; Dansk Kedelforening (1979). 90p. (In Danish).

The growing use of coal as fuel in the Danish power plants will have some negative effects on Danish environment. Impacts comprehending air pollution, environmental transport in soil and water, noxious gases and airborne particulates are evaluated. Heavy metals and their effects upon ecosystems are quantitatively evaluated on the basis of a coal-fueled power plant used as a model.

0110 Reserves And Exploration

REFER ALSO TO CITATION(S) 56910, 56911

56855 **(DOE/ET/14690—T1) Peat resources of southern and western Maine.** Cameron, C.C.; Mullen, M.K.; Lepage, C.A. (Maine Dept. of Conservation, Augusta (USA). Maine Geological Survey). 1983. Contract FG18-79ET14690. 129p. NTIS, PC A07/MF A01. Order Number DE84000068.

Peat has been used for many years in agriculture and horticulture primarily because of its ability to retain many times its own weight in water. It has also been used as a domestic fuel for hundreds of years. More recently, peat has been used by nations such as Ireland and the Soviet Union to generate electricity. At the present time, virtually all of the peat harvested in the United States is used in agriculture and horticulture. However, in light of the increasing costs of traditional energy sources, peat is being more closely scrutinized as an alternate fuel source. The State of Maine has significant peat resources, and current estimates suggest that there are as many as 6000 to 8000 individual peat deposits comprising a total land area of 500,000 to 750,000 acres. The current resource evaluation was developed to provide a more comprehensive analysis of available peat resources. This report summarizes the work conducted in southern and western Maine under the Maine Peat Resource Evaluation Program. It includes sketch maps, sections and laboratory analyses on which estimates of the resources are based. These data may be utilized to more accurately assess the energy and agricultural potential of Maine's peatlands. Virtually all peat sold in the United States in 1979 was used for agricultural and horticultural purposes. It was marketed through nurseries, garden centers, and chain stores chiefly in suburban areas of the north-central, northeastern, and middle Atlantic states and Florida. Production during 1980 in the United States was estimated (Searles, 1981) at 790,000 short tons for agricultural use. Value of the 1980 production was about $17,000,000, and the average value per ton was about $21.80. Apparent consumption of peat in the United States during 1980, however, was 1,115,000 short tons, of which imports composed 355,000 short tons.

56856 **(N—8322675) Coal.** (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 10p. NTIS, PC A05/MF A01.

In Energy Resources in New Mexico, p 37-46 (SEE N83-22672 12-42).

Coal production occurs in only two basins-the San Juan and Raton Basins. The most significant coal-bearing formations are found in the San Juan Basin (where more than 90 percent of New Mexico's coal is produced). The quality of coal ranges from high-heat content, coking-quality bituminous coal to non-coking, lower rank subbituminous coal. In addition, the coal is generally low in sulfur content, with wide variations in ash and moisture content from field to field.

0120 Mining

REFER ALSO TO CITATION(S) 56910, 56911

56857 **(DOE/CE/15130—T2) Remote-controlled underground mining system. Project status report, July 1, 1983-September 30, 1983.** Haspert, J.C. (Underground Systems, Arcadia, CA (USA)). 4 Oct 1983. Contract FG01-82CE15130. 4p. NTIS, PC A02/MF A01. Order Number DE84000819.

A pilot hole drilling rig and a full bore drilling rig were designed with their support hardware. Over 150 underground mining operations were contacted for interest in a field research program with the equipment: about 10 percent replied but were reluctant to participate because of the depressed coal market and the forbidding cost of equipment research in a new mining system. (LTW)

56858 **(DOE/EIA—0432) RAMC surface-mining cost-equations development.** (Science Applications, Inc., Wayne, PA (USA)). Sep 1983. Contract AC05-81OR20837. 175p. NTIS, PC A08/MF A01. Order Number DE84001645.

The Resource Allocation and Mine Costing (RAMC) Model is an engineering process model used to provide coal supply cost curves for a set of pre-defined coal types and producing regions. It develops its mining cost estimates on the basis of equations that relate initial capital, deferred capital, and operating costs to annual production and overburden ratio. This report presents revised versions of the model mine cost equations used in the RAMC for the past two years. Surface mining in the United States is accomplished by a variety of different methods, developed to ensure maximum mining efficiency for different topographic and geologic conditions. The original cost equations were based on costs developed for a mine using the area mining method. However, although area mining is well-suited for application in flat-land regions, it is not used in the hilly or mountainous terrain characterizing many of the regions in which surface mining is now conducted. Because the cost differences for the various mining methods available can be substantial, it was believed that the development of new equations, based on five model mine designs covering the major methods, would result in a significant improvement in mine cost prediction. In developing the model mine designs, cost estimates, and final equations, it was necessary to make a number of major assumptions.

56859 **(DOE/EIA—0433) RAMC underground-mining cost-equations development.** (Science Applications, Inc., Wayne, PA (USA)). Sep 1983. Contract AC05-81OR20837. 301p. NTIS, PC A14/MF A01. Order Number DE84001190.

The Resource Allocation and Mine Costing Model (RAMC) is an engineering process model used to provide coal supply curves for a set of predefined coal types and producing regions. It develops mining cost estimates on the basis of equations that relate initial capital, deferred capital, and operating costs to annual production and mine depth. This report presents revised versions of the model mine cost equations used in the RAMC for the past two years. It provides a complete documentation of the latest cost equations and reflects the new mine costing approach (discussed in the following pages) incorporated in unpublished RAMC equations developed in 1980. Before the new costing methodology, developed in 1980 and adopted in 1981, the cost equations were derived on the basis of mining costs developed for a single base case model mine, which was designed to be representative of all underground mines. Adjustment factors were used to account for cost variations resulting from changes in key mining parameters. The primary purpose of the projects begun in 1980, the latest of which is documented in this report, was to improve and enhance the original mine cost equations. In developing the model mine designs, cost estimates, and final equations, it was necessary to make a number of major assumptions. Unlike real-world mine design and cost estimation in which a specific property is to be exploited, specifications (e.g., depth of cover, seam thickness, property shape) were not given, but rather had to be developed for each model mine. Thus, specifications were assumed, and the mine designs proceeded on the basis of these assumed specifications.

56860 **(DOE/ET/12548—17) Status report on the conceptual design of a semi-autonomous mining system.** Gangal, M.D.; Isenberg, L.; Dutzi, E.J. (Jet Propulsion Lab., Pasadena, CA (USA)). 15 May 1983. Contract AI01-76ET12548. 104p. (JPL-PUB—83-42). NTIS, PC A06/MF A01. Order Number DE84000882.

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The concept of a semiautonomous mining system (SAMS), developed by a design team at JPL, holds the promise of increasing the productivity of underground coal mining by 400% while reducing serious injuries by at least 50%. The concept envisions the use of multiple, semiautonomous, room and pillar mining units working in each section, operated by a crew of the same size as contemporary systems. The excavator module in the system is based upon oscillating water-jets technology developed by D. Summers, University of Missouri-Rolla, and others. The jets are embedded into two U-shaped wedges at the end of a convergent structure, which is mounted on advancing chocks. Coal is broken by the combined action of the jet kerfing and wedging action of the excavator. It is then sized and conveyed by a central auger into a mixing chamber, where it is mixed with water to form a slurry. The slurry is transported via an extensible armored hose carrier to the main slurry pump, and injected into hard slurry lines for hoisting to the surface. This document presents the rationale and the trade-offs behind the concept development and then describes the key elements in detail.

56861 **(DOE/EV/04946—6) Environmental aspects of coal production in the Appalachian region. Final project report.** Minear, R.A.; Tschantz, B.A.; Vaughan, G.L. (Tennessee Univ., Knoxville (USA). Energy, Environment and Resources Center). Jun 1983. Contract AS05-76EV04946. 78p. (ORO—4946-6). NTIS, PC A05/MF A01. Order Number DE84001248.

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A comprehensive, multiyear study of environmental effects related to steep slope surface mining has integrated hydrology, water quality, geology, and biology at a single study area in the Appalachian Coal fields of northeast Tennessee. From this study, hydrology, water quality, and biological changes have been quantified and related to the types of mining and reclamation that are practical, the extent of watershed disturbed and the time since mining activity was completed. Since drainage in the study area was essentially non-acid in drainage characteristics, mining impacts aside from the more widely publicized acid mine drainage problem could be evaluated. Surface mining of steep slopes causes altered stream hydrology. There are increases in both peak storm water flow and dry weather flows. This is accompanied by long-term changes in water quality. Calcium, magnesium, manganese, iron, and sulfate levels are elevated. Increases in alkalinity and pH are probably caused more by clay formation and the solution chemistry of some elements than by presence of carbonate minerals. Of these changes, the major factors affecting biological characteristics of these streams are catastrophic storm flows and increased silt loading. Species diversity, richness and population densities were invariably reduced after mining. Presently used sediment-control measures do not mitigate these effects. The practical models for mining operation and the design of control structures which have been developed in this study show promise for wide application with suitable refinement.

56862 **(DOE/EV/04946—6-App.1) New River Project data bases and documentation joint research. Volume 1. Hydrologic and water-quality data. Appendix I.** Dickens, P.S.; Chiang, C.H.; Minear, R.A.; Tschantz, B.A. (Tennessee Univ., Knoxville (USA)). Dec 1982. Contract AS05-76EV04946. 608p. NTIS MF A01. Order Number DE84001247.

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A multi-year comprehensive study of the environmental effects of coal contour surface mining on small mountain watersheds in the New River Basin and Northern Cumberland Plateau of Eastern Tennessee has been conducted. The New River work examined stream hydrology and water quality in six study watersheds. In 1979, this work was expanded to include five additional small wa-

tersheds in an area adjacent to the New River Basin. The mining spoil has been examined with studies of geochemistry, surface runoff, sediment yield, subsurface hydrology, and subsurface water quality. Biological changes associated with surface mining have been examined by The University of Tennessee's Department of Zoology. Data gathering associated with the New River Project spanned a seven year period between 1975 and 1981. Volume I of this document presents the major hydrologic and water quality data bases developed in the above-described research along with the background information needed for their use. Biological and associated water quality data are presented in Volume II. It is hoped that many users - regulatory, industrial, and scientific - will find the New River Project data of worth. To this end, both paper bound and conventionally formatted computer tape versions have been developed and are outlined within these volumes.

56863 **(DOE/EV/04946—6-App.2) New River Project data bases and documentation joint research. Volume 2. Biological and associated water-quality data.** Vaughan, G.L.; Minter, L.; Schiller, J. (Tennessee Univ., Knoxville (USA)). Dec 1982. Contract AS05-76EV04946. 329p. NTIS, PC A15/MF A01. Order Number DE84001246.

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The goal of the biology portion of the New River study has been to evaluate the effects of contour stripmining for coal in small watersheds upon aquatic biota. In the major portion of the study, efforts were concentrated on five streams in the New River basin, including one virgin control. The second concern of the study was to examine the resilience of such aquatic systems. In addition to studying the short term recovery in the Lowe Branch-Bill's Branch group, we examined water quality and biological communities in a series of streams which represent a cross-section of time elapsed since mining. It would seem that aquatic communities in stripmined areas of the New River and similar areas may recover healthy community structures within a period of 20 years providing there is no acid mine influence, no lack of organisms for recolonization, and no further disturbance of the watershed. The maintenance of refugia for recolonizing populations is an increasingly serious concern and should be a target for legislative action. The data included in this file concern only the insect collection and appropriate water quality determinations. Though the study included collections of fishes and diatoms, the insects were found to be the most useful indicators of stream condition. Only the insect data, because of tremendous volume, were computer filed. Surber samples were taken for benthic insects on a monthly basis, weather and roads permitting, from riffles in each stream. An individual sample formed of a composite of eight 0.2 sq. meter samples per site was shown to be adequate. Restricting sampling to random sites within one particular habitat (stratified random sampling) enabled better comparisons between disturbed and undisturbed streams to be made. Water quality was determined by standard methods at the time Surber samples were taken.

56864 **(N—8322687) Monitoring strip mining and reclamation with LANDSAT data in Belmont County, Ohio.** Witt, R.G.; Schaal, G.M.; Bly, B.G. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 23p. (E—83-10209; NASA-TM—85001). NTIS, PC A02/MF A01.

The utility of LANDSAT digital data for mapping and monitoring surface mines in Belmont County, Ohio was investigated. Two data sets from 1976 and 1979 were processed to classify level 1 land covers and three strip mine categories in order to examine change over time and assess reclamation efforts. The two classifications were compared with aerial photographs. Results of the accuracy assessment show that both classifications are approximately 86 per cent correct, and that surface mine change detection (date-to-date comparison) is facilitated by the digital format of LANDSAT data.

56865 **(OTA—4900015) Criteria for determining viable mining properties on existing federal coal leases in the western United States. Final report.** Wobber, F.J. (Office of Technology Assessment (U.S. Congress), Washington, DC). Mar 1980. 153p. NTIS, PC A08/MF A01. Order Number DE84900015.

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To assist OTA in fulfilling its Congressional mandate of assessing the present and potential value of existing federal coal leases, a set of technical criteria have been developed that describe (1) representative conventional coal mining operations, (2) general mining conditions, and (3) typical coal characteristics for both surface and underground operations in the seven states in which the majority of federal coal leases lie. The conventional mine profiles developed for the 1980 to 1990 time frame include coal rank, quality, and thickness parameters, minimum leasehold and recoverable reserve requirements, mining technologies, and mine capacities that are likely to be representative of viable mining operations in given coal mining regions. Likely markets for the leased coal have also been identified. The mine profiles provide guidance as to the likely nature and characteristics of mine developments in the 1980's, given individual property and coal characteristics. The mine profiles are organized by state, region, and coal field. Key characteristics of the mine profiles, as well as a summary of how the technical criteria were determined and the sources of information from which the criteria were derived, are summarized. Certain mining trends in Western coal production can be drawn from a review of the mine models. Most of the new mines that have opened in the Rocky Mountain Region in the past five years have been large surface operations with annual production levels of 0.5 to 10 million tons, extracting subbituminous coal in single beds which range in thickness from 10 to 100 feet. Note: papers 74 through 89 are missing in the mastered copy and some pages are attached unbound. (LTW)

56866 **Data acquisition of coal mining machine parameters.** Leech, M.C. (Lee-Norse Co., Belle Vernon, PA); Barczak, T.M. pp 211-226 of Coal mine electrotechnology. Cooley, W.L. (ed.). Morgantown, WV; West Virginia University (1982). (CONF-820782—).

From 6. WVU conference on coal mine electrotechnology; Morgantown, WV, USA (28 Jul 1982).

A portable, intrinsically-safe, battery powered instrumentation package developed under a U.S. Department of Energy sponsored project is described. The system consists of solid-state data sampling recorders; a collection of force, pressure, distance, speed, and power measuring transducers: and a desktop calculator programmed to reduce the data to quantities of engineering significance. The application of this instrumentation to a continuous miner is discussed in relation to coal cutting performance, mechanical component loads, and electric motor operational parameters. (JMT)

56867 **Coal mine electrotechnology.** Cooley, W.L. (ed.). Morgantown, WV; West Virginia University (1982). 428p. (CONF-820782—).

From 6. WVU conference on coal mine electrotechnology; Morgantown, WV, USA (28 Jul 1982).

A conference is presented which deals with electrical technology in mining. Particular emphasis is placed on coal mining. Twenty-seven papers are included in the conference, of which twenty-four have been abstracted and indexed for the Energy Data Base. The papers deal with mine power systems, mine communications, safety systems, automation and control, safety devices and instrumentation, and monitoring. (JMT)

56868 **Peat harvester.** Delme, J.V.R. Swedish Patent 8,103,881-2/B/. 22 Jun 1981. 12p. (In Swedish).

A vehicle for harvesting peat and producing milled and pressed peat at the bog is described. As the vehicle moves along the bog, a large (e.g. 1500 mm) cutting disc with radially mounted teeth moves to-and-fro at right angles to the motion and outside the tracks of the vehicle. The cutting disc spins at about 1500 r/m and the peat is thrown to the inlet of the press where it is formed to a string and later tipped on the bog for drying.

0130 Transport And Handling

REFER ALSO TO CITATION(S) 56843

56869 (DOE/METC—83-69) Evaluation of the Malvern optical particle monitor. Anderson, R.J.; Johnson, E. (Department of Energy, Morgantown, WV (USA). Morgantown Energy Technology Center). Jul 1983. 38p. NTIS, PC A03/MF A01. Order Number DE83017039.

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The Malvern 2200/3300 Particle Sizer is a laser-based optical particle sizing device which utilizes the principle of Fraunhofer Diffraction as the means of particle size measurement. The instrument is designed to analyze particle sizes in the range of 1 to 1800 microns diameter through a selection of lenses for the receiving optics. It is not a single-particle counter but rather an ensemble averager over the distribution of particles present in the measuring volume. Through appropriate measurement techniques, the instrument can measure the volumetric size distribution of: solids in gas or liquid suspension; liquid droplets in gas or other immiscible liquids; and, gas bubbles in liquid. (Malvern Handbook, Version 1.5). This report details a limited laboratory evaluation of the Malvern system to determine its operational characteristics, limitations, and accuracy. This investigation focused on relatively small particles in the range of 5 to 150 microns. Primarily, well characterized particles of coal in a coal and water mixture were utilized, but a selection of naturally occurring, industrially generated, and standard samples (i.e., glass beads) wer also tested. The characteristic size parameter from the Malvern system for each of these samples was compared with the results of a Coulter particle counter (Model TA II) analysis to determine the size measurement accuracy. Most of the particulate samples were suspended in a liquid media (water or isoton, plus a dispersant) for the size characterization. Specifically, the investigations contained in this report fall into four categories: (a) Sample-to-lense distance and sample concentration studies, (b) studies testing the applicability to aerosols, (c) tests of the manufacturer supplied software, and (d) size measurement comparisons with the results of Coulter analysis. 5 references, 15 figures, 2 tables.

56870 (DOE/PC/40807—T8) Flow and design characteristics of the hydrocyclone for the recovery of coal fines. Eighth quarterly report, June 1, 1983-August 31, 1983. Davis, P.K. (Southern Illinois Univ., Carbondale (USA). Coll. of Engineering and Technology). 1983. Contract FG22-81PC40807. 17p. NTIS, PC A02/MF A01. Order Number DE83018110.

Tasks accomplished or in progress during the months of June, July, and August 1983 are reported for the following: (1) master's thesis completed entitled A Study of the Effects of Design and Operating Parameters on Hydrocyclone Performance; (2) progress on the users manual; and (3) additional findings on the separation of coal fines from gob (minerals wastes).

0140 Combustion

REFER ALSO TO CITATION(S) 56819, 56827, 56827, 56834, 56836, 57021, 57448, 57484, 57523, 57524, 57526

56871 (DOE/ET/15457—1428) Long-term materials test program. Quarterly report, July-September 1982. (General Electric Co., Schenectady, NY (USA). Advanced Energy Programs Dept.). 1982. Contract AC21-79ET15457. 79p. NTIS, PC A05/MF A01. Order Number DE84000040.

Two nominally 200-hour tests were conducted in the Pressurized Fluidized Bed (PFB) Coal Combustion Facility. These tests were designed to provide additional information on gas-turbine materials performance in a PFBC environment. The tests were performed as part of the corrosion validation tests conducted under the Long-Term Materials Test Program to establish test conditions for the long term materials test. A nominal 1750°C bed temperature and low alkali (0.1 wt % sodium plus potassium) Pfizer dolomite used in conjunction with high sulfur (4.5 wt %), high chlorine (0.17 wt %) Brookville seam coal caused significant corrosion of gas turbine materials exposed at the gas temperature, 1500° to 1600°F. Cooling the materials 200° to 500°F below the gas temperature resulted in greater corrosion attack on many of the materials. A lower bed temperature of 1650°F with a higher alkali (0.9 wt %) Tymochtee dolomite and the same coal caused significantly less corrosion of both the uncooled and cooled materials.

56872 (DOE/PC/50254—T5) Investigation of vaporization and devolatilization of coal/water mixtures. Fifth quarterly report, May 1, 1983-July 31, 1983. Solomon, P.R.; Hamblen, D.G.; Markham, J.R. (Advanced Fuel Research, Inc., East Hartford, CT (USA)). 31 Aug 1983. Contract AC22-82PC50254. 40p. NTIS, PC A03/MF A01. Order Number DE84001217.

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The objective of this program is to develop the capabilities to predict the vaporization and devolatilization behavior of coal/water mixtures under conditions appropriate for spray combustion. The program is currently collecting data in an entrained flow coal reactor which has a fixed position, coal/water slurry spray injector and a movable product extractor. This reactor is being used to study the vaporization and pyrolysis of coal/water slurries. FT-IR is used for the analysis of the product gases, tars and chars to determine species evolution kinetics and kinetics of secondary reactions such as steam-char reactions, cracking, soot formation, char gasification, cenophere formation and particle swelling, and char reactivity. Temperature measurements were made along the center line of the test section of the reactor by removing the collection system and inserting a suction pyrometer through the bottom of the reactor. The temperature profile is quite constant in the top 40 cm of the reactor, but then drops off about 150° in the lower 20 cm. Data for the Pittsburgh Seam coal/water slurry were collected at furnace temperatures of 1100°C and 1300°C. The general behavior of the various species indicates more conversion of aliphatic to CO and CO_2, compared to dry coal pyrolysis. Chars from slurry pyrolyses at 1100°C and 1300°C show substantial agglomeration, with the 1300°C char showing the largest effect. The char particles from the water coinjection case appear to be individual coal particles which have swelled into cenospheres, whereas with the slurry there are clearly many coal particles.

56873 Combustion rates of coal chars: a review. Smith, I.W. (Commonwealth Scientific and Industrial Research Organization, North Ryde, Australia). *Symposium (International) on Combustion, [Proceedings];* 1045-1065(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A brief description is given of devolatilization of raw coal and combustion of the residual char. Major achievements in the study of devolatilization and important areas for further experimentation are noted; however, attention is focussed on the rate processes involved in char combustion. Means of calculating reaction rates are shown which account for temperatures of particles, mass transfer and diffusion of oxygen into the particle's pore structure, and reaction on the pore walls. Theoretical consideration is then given to the changes in the size, density, and pore structure of chars as they burn. Experimental data are shown for observed reactivities of coal chars corrected for external mass transfer effects, and intrinsic reactivities are reported for various coal chars and other carbons corrected for pore diffusion effects. Measured data on mass-transfer rates and changes in particle structure during combustion are given. Recommendations are made for further research on char reactivity and the manner in which pore structure develops during combustion. The need for combustion-oriented kinetics studies of coal devolatilization is outlined. 120 references, 18 figures.

56874 High intensity combustion of coal. Essenhigh, R.H.; Farzan, H. (Ohio State Univ., Columbus). *Symposium (International) on Combustion, [Proceedings];* 1105-1111(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A vertical tunnel furnace has been used to burn coal and char under conditions of intense mixing obtained by using impinging jet streams at the top of he furnace. Combustion in all cases was rapid, with 99% burn-out in about 300 ms for the coals and 1200

ms for the char. Burning times in other furnaces are typically reported as 1 to 2 s. In all cases, the burn-out curves were well predicted by a simple mixing model with diffusional kinetics. The predicted curves were insensitive to temperature. The difference between the coal and char was primarily the rapid loss of mass by the coal (Q-factor 1.8) due to pyrolysis, so that there was relatively greater solid mass at high density to be burned-out in the case of the char. Comparison with predictions from other tested kinetic schemes indicates that the chemical kinetics must be so substantially enhanced by the firing conditions that the chemical reaction reistance becomes unimportant compared with the diffusional resistance. The firing condition identified as that most likely to be the source of the rate of enhancement is the rate of heating, at about 10^6K/S compared with the more usual value of about 10^4K/S in slower burning flames.

56875 **Characteristics of single particle coal combustion.** Timothy, L.D.; Sarofim, A.F.; Beer, J.M. (Massachusetts Inst. of Tech., Cambridge). *Symposium (International) on Combustion,* [*Proceedings*]; 1123-1130(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A two-color optical pyrometer has been developed to measure the burning history of single coal particles. From the intensity traces at two wavelengths information on burning times, burning temperatures, the duration of a volatile flame, and projected areas were obtained for two lignite and three bituminous coals. The coals were pulverized, classified in 38 to 45 and 90 to 105 micron size ranges, and burned at furnace temperatures of 1250 and 1700 K in atmospheres containing from 15% to 100% oxygen. The intensity traces at short times showed the influence of either attenuation by volatiles or, in some cases, an intense peak attributed to luminous radiation by soot. A model was developed to simulate the combustion of a coal particle. Model predictions of the duration of volatile flames were in agreement with the values inferred from the intensity traces. Burning times predicted by the model were in partial agreement with measured values. At 1700 K the bituminous coal burned close to the predicted diffusion-limited times while the lignite coal took longer. At 1250 K the experimental burn-out times for all coals were longer than predicted. Possible reasons for the low predictions may be differences in volatile yields and retardation of the reaction by finely distributed ash particles.

56876 **Domains of flammability and thermal ignitability for pulverized coals and other dusts: particle size dependences and microscopic residue analyses.** Hertzberg, M.; Cashdollar, K.L.; Ng, D.L.; Conti, R.S. (Pittsburgh Research Center, Pennsylvania). *Symposium (International) on Combustion,* [*Proceedings*]; 1169-1180(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The particle size dependence for the lean limits of flammability in air of Pocahontas coal dust, Pittsburgh coal dust, and polyethylene powder were measured. In all cases, the lean limits measured in an 8-liter chamber became insensitive to particle size below some characteristic diameter. Above those characteristic diameters, the lean limit concentrations increased significantly with increasing particle size until a critical size was reached, above which the dust was nonflammable for any concentration at ambient temperature and pressure. Both the characteristic diameter and the coarse size limit of flammability (critical diameter) increased monotonically with increasing dust volatility and increasing oxygen content of the dispersing gas. The minimum autoignition temperatures (AIT's) display behavior similar to that of the lean limit concentrations, except that heating of the mixture to the elevated temperature required for such thermal ignitability studies markedly increases its flammability range. At those elevated initial temperatures, the characteristic sizes are shifted to larger diameters and no critical sizes were observed for some of the AIT mesurements even at the coarsest sizes studied. Also presented are scanning electron microscope (SEM) data revealed the structural changes from dust explosions. A theory is presented which isolates the important physical processes in their simplest form.

56877 **Flammability characteristics and structure of a pulverized coal, laminar opposed jet diffusion flame.** Graves, D.B.; Wendt, J.O.L. (Univ. of Arizona, Tucson). *Symposium (International) on Combustion,* [*Proceedings*]; 1189-1196(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A novel use of the opposed jet diffusion flame in an experimental study of laminar, pulverized coal flames is described. The opposed jet configuration has previously only been used to study gaseous diffusion flames stabilized either between two jets or off evaporating surfaces. In those cases it yielded information on fuel pyrolysis and so its extension to pulverized coal seems well motivated. It is shown, both theoretically and experimentally, that the p.f. laminar opposed jet flame is one dimensional in species concentration and temperature. Particle size segregation does occur but, provided Stokes drag is applicable, the one dimensionally holds for particle size and number density even when particles do not follow gas streamlines. In general, the opposed jet configuration allowed investigation of the effects of non-premixing of pulverized fuel and oxygen on flame structure and characteristics. Although fundamentally different, this flame possessed some surprising similarities to premixed pulverized coal-air flames. Because of its one dimensionality in temperature and species concentrations and because of apparent similarities in propagation mechanisms, the opposed jet flame can be viewed as the diffusion flame analog to more traditional premixed flame studies.

56878 **Pulsating combustion of coal in a Rijke type combustor.** Zinn, B.T.; Miller, N.; Carvalho, J.A.; Daniel, B.R. (Georgia Inst of Tech., Atlanta). *Symposium (International) on Combustion,* [*Proceedings*]; 1197-1203(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

This paper decribes results obtained in an investigation of the feasibility of burning coal in a pulsating mode of combustion in a combustor whose design was based upon the Rijke tube principles. The combustor consisted of a vertical tube opened at both ends with a coal burning bed located in the middle of its lower half. This study demonstrated that in contrast to the difficulties and limitations experienced by previously developed coal burning pulsating combustors, the combustor constructed for this investigation can burn unpulverized coal stably and continuously under either self aspiring or forced flow modes of operation. In the latter case, either fuel rich or fuel lean operation is possible with optimum operation occurring near stoichiometric conditions, suggesting that systems utilizing a coal burning, Rijke type pulsating combustor should possess high thermal efficiencies. The fact that the combustor can operate under fuel rich conditions indicates that it can possibly be used as a coal gasifier. Finally, the paper described CO, CO_2, and particulate productions. Combustion efficiencies ranged between 89 and 98.5% for air/fuel ratios between 1.03 and 1.22 respectively.

56879 **Elutriation of attrited carbon fines in the fluidized combustion of a coal.** Chirone, R.; Cammarota, A.; D'Amore, M.; Massimilla, L. (Instituto di Chimica Industriale e Impianti Chimici, Napoli, Italy). *Symposium (International) on Combustion,* [*Proceedings*]; 1213-1221(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The relevance of coal fragmentation and bed emissions of combustible gases on the performance of the fluidized combustion of a coal and, in particular, on the elutriation rates of attrited carbon fines, is investigated for various coal feed sizes. Experimental data are compared with results of model calculations carried out with different assumptions as regards actual coal feed size distribution, because of fragmentation, and actual oxidation conditions of the bed, owing to bed emissions of combustible gases subsequently burnt in the free board. Disregarding these phenomena results in model overestimations of elutriation rates of attrited carbon fines. Under the working conditions tests, discrepancies between calculation results and experimental observations are specially found when

neglecting, at low excess air factors, the effects of bed emissions of combustible gases.

56880 **Mechanisms governing the destruction of nitrogeneous species during the fuel-rich combustion of pulverized coal.** Glass, J.W.; Wendt, J.O.L. (Univ. of Arizona, Tucson). *Symposium (International) on Combustion,* [*Proceedings*]; 1243-1251(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A 2kg/h downflow combustor was used to investigate the fuel-rich combustion of a Utah coal char. Time resolved profiles of major and minor nitrogeneous species, of char nitrogen concentrations, and of optical particle temperatures, allowed global heterogeneous kinetics of NO destruction to be evaluated. Similar data from the parent Utah bituminous coal at SR = 0.8 and SR = 0.4 yielded time resolved profiles of high concentrations of HCN, NO and NH_3. The decay of NO in the coal post flame was not consistent with the heterogeneous rate determined from the char data. Rather, the data suggest that reactions in the gas phase dominate and that the destruction of NO, NH_3 and HCN can be quantitatively modeled using Fenimore's gas phase mechanism with the folowing rate constants: r_1 = d/dt[HCN] = -5.5 x 10^{17} exp (-83,300/RT) [HCN] $[H_2O]/[H_2]^{1/2}$ mole/cm^3s r_2 = d/dt [NO] = -2.2 x 10^{16} exp(-54,400/RT) [NO] $[NH_3]/[H_2]^{1/2}$ mole/cm^3s and with d/dt [NH_3] = d/dt [NO] - d/dt [HCN].

56881 **Influence of NH_3 addition on the NO emissions from a coal-fired fluidised bed combustor.** Hampartsoumian, E.; Gibbs, B.M. (Univ. of Leeds, England). *Symposium (International) on Combustion,* [*Proceedings*]; 1253-1262(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The feasibility of ammonia injection directly into a fluidised-bed coal combustor for the control of NO emissions by selective noncatalytic homogeneous reactions was studied. Experimental runs were carried out using a bituminous coal and a low volatile anthracite fired in a 0.3 m square combustor. The ammonia was either premixed with the combustion air or directed horizontally across the fluidising air flow through injectors designed to ensure a uniform distribution of NH_3 over the total width of the combustion chamber. The combustor was operated over an excess air range of -20 to 120% and bed temperatures of 770 to 910° C. Results showed that for NH_3 injection at the optimum location just above the bed surface, a 30 to 50% reduction in the NO levels in the exit flue was attainable for a NH_3/NO molar ratio of 2 to 4 and a bed temperature of around 825° C. A maximum reduction of 75% was possible by using excess ammonia, but at the cost of increased ammonia emissions. Premixing the ammonia with the combustion air initially resulted in an increase in the NO levels, whilst at higher NH_3 flows, marginal reductions in the NO emission were observed. The presence of excess air was found to lower the extent of NO removal, with optimum reductions occurring at an oxygen concentration of around 3 to 5% at the point of injection. Varing the bed temperature in the range 770 to 910°C did not significantly influence the extent of NO reduction and it is thought that the reductions achieved, especially at the lower bed temperatures, can partly be accounted for by the presence of unburnt volatile fragments (e.g. H_2, CH_4) which are known to enhance the NO/NH_3 reaction.

56882 **Theory for NO formation in turbulent coal flames.** Smith, P.J.; Hill, S.C.; Smoot, L.D. (Brigham Young Univ., Provo, Utah). *Symposium (International) on Combustion,* [*Proceedings*]; 1263-1270(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A NO pollutant model has been formulated to be consistent with the assumptions made in current comprehensive models for fuel-rich turbulent pulverized-fuel flames. The model accounts for the effects of turbulent fluctuations. The pollutant species equations are decoupled from the overall velocity, temperature and major species field equations. The fuel nitrogen is assumed to evolve from the coal at a rate proportional to coal weight loss, and to react quickly to HCN in the gas phase. The homogeneous rate of decay of HCN to NO or N_2 includes the effects of turbulent fluctuations to obtain a time-mean reaction rate. Heterogeneous reduction of the NO is modeled by a slow (non-fluctuating) rate. The time-mean reaction rates are obtained by assuming that the species mass fractions are linear functions of stoichiometry, and then integrating the resulting kinetic expression over the probability density functions for the appropriate mixture fractions. Computations are presented to demonstrate the applicability of the theory to practical coal combustion chambers.

56883 **Influence of coal composition on the fate of volatile and char nitrogen during combustion.** Chen, S.L. (Energy and Environmental Research Corp., Irvine, CA); Heap, M.P.; Pershing, D.W.; Martin, G.B. *Symposium (International) on Combustion,* [*Proceedings*]; 1271-1280(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Fifty coals from North America, Europe, Asia, South Africa and Australia were burned in a 21 kW, refractory-lined tunnel furnace to determine the influence of coal properties on the fate of volatile nd char nitrogen. Excess air fuel NO emissions (as determined by combustion in $Ar/O_2/CO_2$) ranged from 415 to 1380 ppM with a premixed burner. These results correlated with total fuel nitrogen, inert pyrolysis HCN yield, and non-volatile nitrogen content, rather than with the geographic origin of the coal. Minimum staged NO emissions (at optimum first stage stoichiometry) ranged from 140 to 380 ppM. Detailed in-flame measurements indicated that as first stage stoichiometry (air/fuel) was reduced, first stage NO formation decreased, but was ultimately offset by increases in oxidable gaseous nitrogen species and solid phase nitrogen retention. TFN (NH_3 + NO + HCN) generally increased with increasing fuel nitrogen and the species distribution was dependent upon coal rank. In general, HCN was greater than NH_3 with bituminous coals, but less than NH_3 with subbituminous and lignite coals. Second stage TFN conversion to exhaust NO decreased as the TFN distribution was shifted in favor of HCN and NH_3. Char nitrogen conversion was generally low (less than 20 percent). Exhaust emissions were correlated in terms of the gas phase TFN and the char nitrogen entering the second stage. Increasing heat extraction generally reduced exhaust NO emissions via a complex mechanism. Reducing second stage flame temperatures had little effect on the concentration and speciation of the XN species leaving the first stage, and on the conversion of solid phase nitrogen in the second stage. However, it dramatically decreased the second-stage conversion of gas phase TFN to exhaust NO. The controlling mechanism appears to be selective NO reduction by NH/sub i/ species. The effectiveness of increased heat extraction rate was also found to depend heavily on the coal composition.

56884 **Nitric oxide reduction in the freeboard of a fluidized bed coal combustor.** Walsh, P.M.; Chaung, T.Z.; Dutta, A.; Beer, J.M.; Sarofim, A.F. (Massachusetts Inst. of Tech., Cambridge). *Symposium (International) on Combustion,* [*Proceedings*]; 1281-1289(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Nitric oxide mole fractions of 650 to 1250 ppM were observed in the combustion products near the bed surface during fluidized combustion of bituminous coal. Reduction of NO to N_2 in the freeboard above the bed decreased NO to the characteristically low levels (80 to 400 mol ppM) observed in the exhaust from fluidized bed combustors. The experimentally measured variations of NO with height in the freeboard are compared with the predictions of a semi-empirical model in which NO reduction is assumed to occur by reaction with entrained coal char. The concentration of char particles is determined from measured bed properties using mechanistic models for the initial particle flux at the bed surface and the motion of particles in the freeboard. The nitric oxide reduction predicted by the model is in good agreement with the reduction observed in five of the six sets of measurements.

56885 **Reduction of NO/sub x/ and solids emissions by staged combustion of coal liquid fuels.** Beer, J.M. (Massachusetts Inst. of Tech., Cambridge); Jacques, M.T.; Farmayan, W.F.; Gupta, A.K.; Hanson, S.; Rovesti, W.C. *Symposium (International) on Combustion,* [*Proceedings*]; 1301-1309(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Results are reported of experiments on the amenability of SRC-II coal-derived liquid fuels to combustion process modification by air staging for NO/sub x/ and solids emission control. Two experimental systems were used: (1) a laboratory laminar flow reactor for determining rates of evolution of fuel-bound nitrogen from pyrolyzing arrays of 150 μm SRC-II fuel droplets, and (2) a pilot plant scale furnace for determining the effects of combustion air staging, air preheat, quality of atomization and fuel type on the conversion of fuel-nitrogen to NO/sub x/. Three SRC-II fuel types were considered in the studies: a medium distillate (450 to 500 K boiling range), a heavy distillate (560 to 728 K boiling range), and a 2.9/1 blend of medium to heavy distillate. Results of the droplet array pyrolysis studies show that, in general nitrogen evolution rates are trailing mass vaporization rate at the beginning of droplet vaporization but that the two rates are comparable after a mass loss of 10 to 20%. For the heavy distillate and for the case of high rates of vaporization, nitrogen evolution rates exceed those of vaporization due to departments from equilibrium distillation conditions. Results of the combustion experiments show that there is a significant potential for controlling NO/sub x/ and particulate matter emissions in coal-derived liquid fuel flames by combustion modifications.

56886 Formation and control of NO emissions from coal-fired spreader-stoker boilers. Starley, G.P. (Univ. of Utah, Salt Lake City); Slaughter, D.M.; Munro, J.M.; Pershing, D.W.; Martin, G.B. *Symposium (International) on Combustion, [Proceedings]*; 1311-1320(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

This paper describes the results of a study on the formation and control of nitrogen oxides in coal-fired spreader-stoker systems. Three scales of experimental equipment were used to define the evolution and oxidation of fuel nitrogen in the fuel suspension phase, the conversion of fuel nitrogen during fixed-bed combustion, and the coupling between the two combustion phases. The results indicate that NO emissions from spreader-stoker-fired coal furnaces are the result of relatively high conversions of fuel nitrogen evolved from particles less than 0.1 inches in the suspension phase and low conversion of fuel nitrogen during the bed combustion. In the suspension phase, nitrogen is evolved at approximately the same rate as carbon is oxidized. Local oxygen availability is the primary control parameter for both phases of the combustion. Minimum overall fuel nitrogen conversions of 6 percent were achieved in the pilot scale facility by controlling the stoichiometry in both combustion zones.

56887 Parameters influencing the evolution and oxidation of sulfur in suspension phase coal combustion. Slaughter, D.M. (Univ. of Utah, Salt Lake City); Pershing, D.W.; Drehmel, D.C.; Martin, G.B. *Symposium (International) on Combustion, [Proceedings]*; 1321-1329(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

This paper describes the results of a two-year study of the formation of sulfur oxides in the suspension phase of a coal-fired spreader-stoker system. An eight foot, drop-tube furnace with upward hot-gas flow was used to define the evolution and oxidation of fuel sulfur in the suspension phase and to establish the influence of the combustion parameters on SO_3 formation. Results indicate that coal particles greater than approximately 0.1 inch fall to the stoke grate essentially unreacted. Thus, only between 8 and 20 percent of the coal feed actually burns in the suspension phase. In general, the evolution and oxidation of sulfur lags hydrogen but leads carbon. The behavior of the organic sulfur closely follows that of carbon; however, the decomposition of the sulfate sulfur depends primarily on the local temperature and oxygen concentration. The behavior of the sulfate sulfur is of major importance because of the high sulfate content of the natural coal fines.

56888 Vaporization of refractory oxides during pulverized coal combustion. Quann, R.J.; Sarofim, A.F. (Massachusetts Inst. of Tech., Cambridge). *Symposium (International) on Combustion, [Proceedings]*; 1429-1440(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A laboratory coal combustor was used to study the vaporization behavior of ash during pulverized coal combustion. The variation in the amount and composition of the ash vaporization rate of Si, Mg and Ca was also investigated. At a moderate combustion temperature of 2000° K, the amount of ash vaporized was on the order of a few percent of the total ash content of the coals tested. The ash vaporized from combustion of subbituminous coals and lignites is composed primarily of MgO or of Na_2O if the coal contains high concentrations of sodium. The ash vaporized from combustion of bituminous coals is composed primarily of SiO_2 and iron oxide. This effect of rank is a result of the appreciable vaporization of the organically bound magnesium present in the low rank coals. The vaporization rates of Si and Mg are dependent on the coal size and vary by over four orders of magnitude in the combustion temperature range of 1600 to 3000° K. a model presented to interpret the experimental results considers the degree of dispersion of mineral matter in coal, chemical reduction of refractory oxides (SiO_2, MgO, CaO) to the corresponding volatile suboxide or metal vapor, and the internal and boundary layer transport processes. The model adequately describes the vaporization rate of both metals associated with mineral inclusions and those organically bound in the parent coal, and the changes in vaporization rates with changes in temperature and in coal particle size.

56889 Stratified composition of inorganic submicron particles produced during coal combustion. Neville, M.; Sarofim, A.F. (Massachusetts Inst. of Tech., Cambridge). *Symposium (International) on Combustion, [Proceedings]*; 1441-1449(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The submicron particles produced by the combustion of a Montana lignite in twenty percent oxygen at furnace temperature of 1700 K were characterized. The particles are found to consist of a core of magnesium and iron oxides with an inner coating of silica and an outer coating of sodium, arsenic, and other trace metals. The silicon and trace species show an increase in concentration with decreasing particle size in the submicron range (≦ 400 angstroms). The experimental results can be explained by a model in which MgO nucleates homogeneously in the boundary layer of a burning coal particle and coalesces to a primary particle size of 160 angstroms. Silicon deposition subsequently occurs as a probable consequence of the low rate of oxidation of the SiO vapors released by the burning coal particle. Volatile trace species condense on the outer surface when the combustion products are quenched.

0150 Marketing And Economics

REFER ALSO TO CITATION(S) 57251

0160 Health And Safety

REFER ALSO TO CITATION(S) 56876, 57035, 57036

56890 (LMF—103) Potential health and environmental effects of the fluidized-bed combustion of coal - 1982 update. Seiler, F.A.; Hobbs, C.H.; Cuddihy, R.G. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA). Inhalation Toxicology Research Inst.). Mar 1983. Contract AC04-76EV01013. 86p. NTIS, PC A05/MF A01. Order Number DE84001089.

The Health and Environmental Effects Document 1982 consists of an updated summary of last year's HEED and four short reports of a generic nature. The first section is a summary of last year's HEED, updated as far as possible from the results of the subsequent sections of this year's report. The changes imposed by a more extensive error calculation are relatively minor, since good

approximations were used already last year. The contributions of hazards due to solid waste, however, are more substantial, since they are given as worst-case estimates. The second section deals with a problem common to all methods of coal combustion: the disposal of solid wastes and the potential hazards arising from toxicants contained in them. Worst case estimates are made for health hazards on local and national scales. The next two studies address one of the main problems in dealing with uncertainty: the propagation of large errors in the course of a calculation. In the third section it is demonstrated that an analytical treatment is possible for many algebraic structures encountered in risk assessments, a general formalism is derived and applied to a few special cases. The fourth section is less mathematical, containing a discussion of properties and treatment of errors and an application of the formulae derived in preceding section to a number of simple algebraic forms encountered frequently in risk assessments. The fifth and final section deals with another recurrent problem: the selection of an appropriate atmospheric dispersion model for risk assessments dealing with entire technologies. The evaluation of risks on a national scale necessitates the use of averaging procedures at varous stages of the calculation. In this context, the appropriate balance between the quality of the data available and the complexity of the dispersion model is discussed.

56891 **(ORNL-TM—8926) Industrial hygiene evaluation during startup operations at the CAN DO anthracite coal gasification plant, Humboldt, Pennsylvania.** Hunt, D.B.; Van Hoesen, S.D.; Findlay, S. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 75p. NTIS, PC A04/MF A01. Order Number DE84001552.

Industrial hygiene information collected during the initial startup and shakedown operation of the CAN DO gasifier at Humboldt, Pennsylvania is summarized. Information presented was collected during the four initial plant operating periods (February 24-March 21, 1981, June 8 to 12, 1981, December 21 to 23, 1981 and February 17 to 24, 1982) covering operation of all major gasifier systems including delivery of process gas to an industrial user. Employee exposures to selected work place stresses were evaluated. It was determined that carbon monoxide (CO) presented the greatest exposure potential for the workers. Plant operations and equipment performance were also evaluated during the startup periods. Specific suggestions that were provided to CAN DO during the starting period to reduce process gas emission are discussed and general recommendations for controlling employee exposures are presented.

02 PETROLEUM

0201 Reserves

56892 **(DOE/EIA—0216(82)) US crude oil, natural gas, and natural gas liquids reserves. 1982 annual report.** (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). Sep 1983. 90p. NTIS, PC A05/MF A01 - GPO. Order Number DE84001001.

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Findings are presented for the total US, as well as State and selected geographic areas, on proved reserves of crude oil, natural gas, and natural gas liquids as of December 31, 1982. Production volumes are also provided for each of these three categories. Data are also presented on notable exploration and developmental activities during 1982 and on the reported commitment status of domestic proved reserves and nonproducing reserves of natural gas. These findings are based upon data obtained from two annual EIA surveys: Form EIA-23, Annual Survey of Domestic Oil and Gas Reserves; and Form EIA-64A, Annual Report of the Origin of Natural Gas Liquids Production.

56893 **(N—8322674) Oil and gas.** (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 20p. NTIS, PC A05/MF A01.

In Energy Resources in New Mexico, p 17-36 (SEE N83-22672 12-42).

New Mexico's crude oil and natural gas reserve base was never fully identified. Variation was due to the methods used for calculation, differing geological and engineering approaches in assuming recovery, and agency reporting. Assessment of the reserve base was determined by adding a conservative estimate of gas available from infill drilling on developed acreage as well as adding conservative estimates of gas available in undeveloped acreage.

0202 Geology And Exploration

REFER ALSO TO CITATION(S) 56924

56894 **(N—8322683) Geophysical methods in oil and gas prospecting.** (Joint Publications Research Service, Arlington, VA (USA)). Feb 1983. 3p. NTIS, PC A04.

In USSR Rept.: Earth Sci., No. 24 (JPRS-82772), p 33-35 (SEE N83-22680 12-42) Transl. into English from Pravda (Moscow), 4 Aug. 1982, p 2.

The physical principles of the methods and techniques for sounding the zone around the borehole with a flux either of neutrons or acoustic energy in a relatively broad band of intensities and frequencies are developed.

56895 **(N—8322762) Exploration deliberations.** Stahl, W.; Kvenvolden, K. (Geological Survey, Menlo Park, CA (USA)). Jan 1982. 8p. NTIS, PC A07/MF A01.

In Univ. of South Florida Workshop Rept. on Basic Res. in Org. Geochem. Appl. to Natl. Energy Needs, p 9-16 (SEE N83-22760 12-44).

Of the many directions that organic geochemistry could take relative to the solution of problems in petroleum exploration, three appear to have the greatest promise. Basic organic geochemical research in the areas of migration, kerogen, and depositional model systems should yield the most significant results relative to national energy needs. Migration of petroleum is one of the least understood phenomena in petroleum geology. New information in this area should increase the ability of explorationists to predict where petroleum has moved in the subsurface and where it now resides. Kerogen is the dispersed, insoluble organic matter in sedimentary rocks that is a basic substance in petroleum generation. Increased knowledge of its origin, composition, and alteration could be particularly valuable to explorationists. Depositional model systems combine the geologic framework with petroleum geochemistry to yield predictive models for understanding petroleum occurrence.

56896 **(N—8322765) Problems in organic geochemistry applied to petroleum exploration and production.** Hunt, J.M. (Woods Hole Oceanographic Institution, MA (USA)). Jan 1982. 33p. NTIS, PC A07/MF A01.

In Univ. of South Florida Workshop Rept. on Basic Res. in Org. Geochem. Appl. to Natl. Energy Needs, 33 p (SEE N83-22760 12-44).

This overview is an outline of some areas where basic studies are needed to improve the discovery and utilization of oil and gas. Topics discussed include hydrocarbon detection, sediments, gas origin, gas seepage and sea water analysis.

0203 Drilling And Production

REFER ALSO TO CITATION(S) 57307, 57465

56897 **(DOE/BC/10069—22) Mechanism of oil-bank formation, coalescence in porous media, and emulsion stability. Third annual report, June 1980-September 1981.** Wasan, D.T. (Illinois Inst. of Tech., Chicago (USA)). Sep 1983. Contract AC19-79BC10069. 193p. NTIS, PC A09/MF A01. Order Number DE84001684.

In this report we present results of a basic study of the various mechanisms of oil bank formation and propagation in chemical flooding processes involving surfactants and alkaline agents. Also presented are the results of modeling and simulation studies of our microwave monitored laboratory core flooding experiments in alkaline flooding and in drainage and stability of thin surfactant films associated with foam and emulsion systems. This work encompasses two topics: 1) Alkaline Flooding, and 2) Surfactant Flooding. 59 references, 63 figures, 19 tables.

56898 **(DOE/BC/10321—12) Improved polymers for enhanced-oil-recovery synthesis and rheology. Fifth annual report, October 1981-September 1982.** McCormick, C.L.; Hester, R.D.; Neidlinger, H.H.; Wildman, G.C. (University of Southern Mississippi, Hattiesburg (USA). Dept. of Polymer Science). Oct 1983. Contract AS19-80BC10321. 225p. NTIS, PC A10/MF A01. Order Number DE83017371.

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The goal of this project is to gain a more complete understanding of structure/property/performance interrelationships of water-soluble polymers which can aid industry in commercial production of polymers which are more efficient than those presently used. During the past the following have been accomplished: synthesis of model dextran-g-poly(acrylamide-co-sodium acrylates); synthesis of model dextran-g-poly(acrylamide-co-sodium-2-acrylamido-2-methylpropane sulfonates); characterization of model copolymers by elemental analysis, C-13NMR, and viscometry; study of dilute solution properties of the models including the effects of temperature, salt, pH; rheological studies of model graft copolymers; development of mathematical models, new calibration functions, analytical methods, and data acquisition techniques for aqueous size exclusion chromatography; application of quasielastic light scattering techniques to the study of hydrodynamic volume concepts; preferential and overall solvation studies of AN/NaA and AM/NaAMPS copolymers; study of phase behavior of model polymers in mono- and multivalent electrolytes at different polymer and salt concentrations as a function of temperature; education and training of students in basic energy research.

56899 **Experimental determination of friction factors for mist and foam drilling and well cleanout operations.** Okpobiri, G.A. (University of Tulsa, Tulsa, Oklahoma). *American Society of Mechanical Engineers,* [*Paper*]; **83-PET-30**: 14(1983). Contract AC19-79BC10079.

This work covers both theoretical and experimental analysis of frictional losses due to the presence of solids in vertical flow of solids-foam slurries. Rabinowitsh-Mooney generalized flow equations for time-independent fluids from the theoretical basis for the rheological analysis. Experimental work was done with an apparatus designed to simulate actual field conditions as closely as possible. The test section consists of an annulus with 4.0 inch casing and 1.5 inch tubing. The surface active agent used is an aniomic biodegradable foamer (ADOFOAM BF-1) and constitutes 1 percent of the liquid volume. Foam qualities and wall shear rates ranged from 0.64 to 0.99, and 100 to 1000 sec^{-1}, respectively. Semi-empirical equations for predicting friction factors due to solids are presented. Sandstone and limestone particles were used. Average particle size ranged from 0.025 to 0.11 inches and a total of 337 data points were used in the correlations. Data collection was carried out above solid saltation velocities under fully-developed steady state flow conditions. Results show that the friction factor of suspension can be treated as the sum of the friction factor due to the fluid and that due to the solids. For a constant foam Reynold's number, the frictional losses due to the presence of solids increases as the solids mass flow rate (or solids content) increases. Solids friction factor was found to increase with increasing particles Froude number, density ratio, and solids concentration, but decreases with increasing fluid Reynold's number.

56900 **Equilibrium phase compositions of CO_2/hydrocarbon mixtures-part 1: measurement by a continuous multiple-contact experiment.** Orr, F.M. Jr.; Silva, M.K. (New Mexico Petroleum Recovery Research Center). *Society of Petroleum Engineers of A.I.M.E. (American Institute of Mining, Metallurgical and Petroleum Engineers), Paper;* **23**: No. 2, 272-280(Apr 1982).

A new experimental technique that simultaneously measures compositions and densities of two phases in equilibrium is described. Because it operates continuously, the experiment can be performed more rapidly than conventional static-equilibrium measurements. Details of the experimental apparatus are reported, and results of test displacements for two simple CO_2/hydrocarbon systems are compared with static-equilibrium phase composition measurements for the same systems. A simple analysis of the operation of the experiment is used to assess the experimental error that results from the continuous nature of the experiment and to suggest ways to reduce that error. Application of the experimental technique to a CO_2/crude oil system is reported in a companion paper.

0206 Health And Safety

REFER ALSO TO CITATION(S) 57243

0207 Marketing And Economics

REFER ALSO TO CITATION(S) 56975, 57216, 57251

56901 **(DOE/EI/11548—T1) Number Two Residential Fuel-Oil Price Survey. End-of-survey report.** (Illinois Dept. of Energy and Natural Resources, Springfield (USA)). 31 May 1983. Contract FG01-82EI11548. 12p. NTIS, PC A02/MF A01.

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The State of Illinois participated in the Number Two Residential Fuel Oil Price Survey for the 1982-1983 heating season. Data were collected during the first two weeks of each month from October 1 to May 1, 1983 from 42 participants. The data including ending inventory volumes of No. 2 fuel for the last day of the previous month, whether held in storage, owned, or leased by other firms. The No. 2 heating oil price collected was as of the first working day of the month. The rack and residental prices were recorded for the eight-month period. Results are tabulated.

56902 **(DOE/EI/19619—T1) Prices/stocks of heating oil, State of Oregon. End-of-survey report, 1982-1983.** Falotico, R.R. (Portland State Univ., OR (USA)). 31 May 1983. Contract FG01-82EI19619. 53p. NTIS, PC A04/MF A01. Order Number DE84000931.

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Monthly Residential and Rack prices for Number Two (Diesel) heating oil and End-of-the-Month inventory data from 1 October 1982 through 1 May 1983 is presented. No other data was collected on a regular basis during the course of this survey. However, additional information as to dealer problems, shifts in ownership, and Major Oil Company policies were gathered and passed on with the Monthly Reports or were provided to others, if they were authorized recipients, when requested. A total list of 69 representative firms was provided by the Department of Energy (DOE) as a scientifically selected sample population. A few of the firms declined to participate in any way while some would supply only price information which any interested individual may obtain by simply calling the firm, leaving 43 respondents. Appendix B lists the Monthly Reports and includes reasons given for changes as well as pertinent information that was passed along.

56903 **(DOE/EIA—0202(83/3Q)) Short-term energy outlook. Quarterly projections.** (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). Aug 1983. 47p. NTIS, PC A03/MF A01 - GPO. Order Number DE84000630.

Energy Information Administration (EIA) quarterly forecasts of short-term energy supply, demand, and prices are revised in February, May, August, and November for publication in the Short-Term Energy Outlook, quarterly projections. Methodology volumes, which are published with the May and November issues, contain descriptions of the forecasting system and detailed analyses of the current issues that affect EIA's short-term energy forecasts. The forecasts are produced using the Short-Term Integrated Forecasting System (STIFS). Two principal driving variables are used in the STIFS model: the macroeconomic forecast and the world oil price assumptions. The macroeconomic forecasts, which are produced by Data Resources, Inc., (DRI), are adjusted by EIA in cases where EIA projections of the world price of crude oil differ from DRI estimates. EIA's Oil Market Simulation Model is used to project the world oil prices. The three projections for petroleum supply and demand are based on low, medium, and high economic growth scenarios which incorporate high, medium, and low crude oil price trajectories. In general, the following discussion of the forecast refers to the medium, or base case, scenario. Total petro-

leum consumption sensitivities, using varying assumptions about the level of price, weather, and economic activity are tabulated.

56904 **(N—8322753) World petroleum outlook, 1982.** (Committee on Energy and Natural Resources (U.S. Senate), Washington, DC). 1982. 181p. (GPO—95-066). Avail: Committee on Energy and Natural Resources.

The world petroleum outlook is discussed. The near-term outlook for international supplies of oil are reviewed, and various factors which may affect this supply are explored.

0209 Environmental Aspects

REFER ALSO TO CITATION(S) 56851

0210 Legislation And Regulation

REFER ALSO TO CITATION(S) 57243

0230 Properties

REFER ALSO TO CITATION(S) 56847

0240 Storage

56905 **(SAND—83-1150) User's manual for the salt solution mining code, SANSMIC.** Russo. A.J. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 42p. NTIS, PC A03/MF A01. Order Number DE84001063.

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SANSMIC is a computer code used to predict the development of axisymmetric caverns which are solution mined in salt formations. It was written to aid in the design and operation of Strategic Petroleum Reserve oil-storage caverns. For a prescribed leaching schedule, the code calculates volume and shape changes, including the case of leaching during oil injection (leach-fill) and withdrawal by fresh-water displacement. This manual contains a brief description of the models used in SANSMIC, some comparisons with field data, and detailed instructions for the use of the code as it is currently configured to run on the Sandia CRAY, VAX 11/780, and Cyber 76 computing systems.

0250 Combustion

56906 **Effect of fuel volatility on spray combustion.** Farag, T.M.; Arai, M.; Hiroyasu, H. (Univ. of Hiroshima, Japan). *Symposium (International) on Combustion, [Proceedings];* 511-518(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The effect of fuel volatility on the lean blow-off limit and the temperature distribution in a swirl type combustor was studied. The flame stabilizing mechanism was also discussed. The fuels used were gasoline, kerosene and two types of heavy oils. Gasoline and heavy oil were used as the most and the least volatile fuels respectively. For all fuels used, the blow-off limit shifts to the lean side by increasing the swirl number of the flow, i.e. the flame stability increases. With a weak swirl, the fuel volatility has the higher effect on the blow-off limit than with the strong one where the established recirculation zone has the higher effect on the flame stability. In the absence of a swirl, only one main reaction zone is formed inside the flame around its axis. With a strong swirl, two main reaction zones are formed for kerosene and heavy oil flames, but only one reaction zone for a gasoline flame.

56907 **Study of the burning of a slick of crude oil on water.** Brzustowski, T.A.; Twardus, E.M. (Univ. of Waterloo, Ontario). *Symposium (International) on Combustion, [Proceedings];* 847-854(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Observations of the burning of a slick of fresh crude oil on water, including photographs taken from underneath the slick, have shown that the combustion is very violent for much of the burning time, with burning drops of oil ejected from the flame. At the same time, the slick is violently distrubed and considerable flame radiation is transmitted through it. The violent combustion appears to be the result mainly of eruptive vaporization of the light fractions of the crude. A simple model of oil slick burning is presented. It is one-dimensional and quasi-steady, and does not include liquid-phase processes. It does incorporate heat loss to the water substrate, initial absorption of radiation, decreasing as the slick burns, and the effect of wind on flame, tilt and radiant heat feedback to the slick. The model predicts the minimum thickness for ignition, the unburned residue, the burning time, and the effect of wind on all three quantities.

03 NATURAL GAS

0301 Reserves

REFER ALSO TO CITATION(S) 56892, 56893, 56910

56908 **(DOE/EIA—0416(83)) Gas deliverability and flow capacity of surveillance gas fields in Kansas, New Mexico, and Arkansas.** Rahman, H.; Hicks, J.N. (USDOE Energy Information Administration, Washington, DC. Office of Oil and Gas). Sep 1983. 46p. NTIS, PC A03/MF A01 - GPO. Order Number DE84001288.

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The purpose of this study assesses the long range gas supply of the large gas fields in the three States for the 20-year period, 1982 to 2001. This report should be of particular interest to those in government, industry, and the academic community, who are concerned with the future availability of natural gas. The work involved in this study consisted of estimating the initial gas in place and calculating the deliverability of the surveillance gas fields. The latter was accomplished by means of a computer program.

0302 Geology And Exploration

REFER ALSO TO CITATION(S) 56894, 56896, 56924, 57739

56909 **(DOE/MC/08216—1440-Vol.1) Simulator for unconventional gas resources multi-dimensional model SUGAR-MD. Volume I. Reservoir model analysis and validation.** (Science Applications, Inc., Morgantown, WV (USA)). 1982. Contract AM21-78MC08216. 61p. NTIS, PC A04/MF A01. Order Number DE83017035.

The Department of Energy, Morgantown Energy Technology Center, has been supporting the development of flow models for Devonian shale gas reservoirs. The broad objectives of this modeling program are: (1) To develop and validate a mathematical model which describes gas flow through Devonian shales. (2) To determine the sensitive parameters that affect deliverability and recovery of gas from Devonian shales. (3) To recommend laboratory and field measurements for determination of those parameters critical to the productivity and timely recovery of gas from the Devonian shales. (4) To analyze pressure and rate transient data from observation and production gas wells to determine reservoir parameters and well performance. (5) To study and determine the overall performance of Devonian shale reservoirs in terms of well stimulation, well spacing, and resource recovery as a function of gross reservoir properties such as anisotropy, porosity and thickness variations, and boundary effects. The flow equations that are the mathematical basis of the two-dimensional model are presented. It is assumed that gas transport to producing wells in Devonian shale reservoirs occurs through a natural fracture system into which matrix blocks of contrasting physical properties deliver contained gas. That is, the matrix acts as a uniformly distributed gas source in a fracture medium. Gas desorption from pore walls is treated as a uniformly distributed source within the matrix blocks. 24 references.

56910 **(DOE/METC—83-76) Methane recovery from coalbeds: a potential energy source.** Mroz, T.H.; Ryan, J.G.; Byrer, C.W. (eds.). (USDOE Morgantown Energy Technology Center, WV). Oct 1983. 456p. NTIS, PC A20/MF A01. Order Number DE83015536.

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This document integrates all of the available geologic and coal resource data that have been acquired in the Coalbed Methane Project over the past 5 years to determine the stratigraphic units and geographical areas wherein the methane production potential is classified as favorable. Sixteen basins were included in this compilation. Each basin is a chapter in this report. The chapter write-ups feature sections on geology, coal resource, potential methane resource and recommendations for development of the technology base needed to estimate recovery potential. Information used in the sections is supported by a list of references. The integration of these data has removed much of the uncertainty about what production potential exists and where the favorable trends are located in the basin. This will aid the producers who are considering well-drilling ventures for coalbed methane recovery. Estimates of production performance from any new wells can only be developed once fundamental reservoir property measurements are acquired. This is the next field activity required. Preliminary results of the coalbed methane resource effort show that many of the coal regions in the US have significant volumes of coalbed methane. The evaluation of the core desorption data from over 50 cooperative wells has helped DOE to refine the in-place methane estimates of the various coal regions. The summary of the methane resource estimates for 16 basins is shown in the Summary of Results Table. Based upon these initial results, the basins showing a high resource estimate of coalbed methane include the Piceance, Northern Appalachian, Central Appalachian, Powder River, and Greater Green River.

56911 **(DOE/R4/10427—T1) Utilizing the unconventional gas resources of the Pottsville Formation coals in Tuscaloosa County, Alabama: feasibility study.** (Alabama Univ., University (USA). School of Mines and Energy Development). Jan 1983. Contract FG44-81R410427. 74p. NTIS, PC A04/MF A01. Order Number DE84001504.

The Tuscaloosa County Industrial Development Authority (TCIDA) and The University of Alabama School of Mines and Energy Development (SOMED) have completed a technical and economic feasibility study of the development potential of coalbed methane at the TCIDA Industrial Park near Tuscaloosa, Alabama. A wireline corehole was drilled to a depth of 2901 feet, and core was recovered continuously from the top of the Pottsville Formation of Pennsylvanian Age. Thirty-four coal samples with an aggregate thickness of approximately 32 lineal feet were tested for gas quantity by the US Bureau of Mines direct method and for gas quality by standard chromatographic methods. The direct method gas contents were used to generate estimates of total and recoverable gas. The highest total gas contents measured were in the Pratt (300 cf/ton) and Mary Lee (380 cf/ton) coal groups. An economic feasibility analysis based on producing 117 million cubic feet of recoverable gas per forty acres from the Pratt and Mary Lee Group coals indicates that, at current gas prices, development is not economical as a replacement for conventional natural gas. Payback for the base case is 8.59 years with an internal rate of return of 4.74%. 17 figures, 13 tables.

56912 **Methane in Cretaceous and Paleocene coals of western Colorado.** Tremain, C.M.; Boreck, D.L.; Kelso,B.S. (Colorado Geological Survey, Denver). *Field Conference Guidebook (New Mexico Geological Society);* **32**: 241-248(1981). (CONF-8110216—). Contract FG21-80MC14256.

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

Western Colorado is the site of coal, oil, and natural gas development in three principal areas: the San Juan River, the Unita, and the Green River regions. Evidence is accumulating that some of the coals in these regions both act as a source and potential reservoir for natural gas (methane). This paper details some of the evidence and describes work being done by the Colorado Geological Survey to estimate methane resources of these regions. (JMT)

0303 Drilling, Production, And Processing

REFER ALSO TO CITATION(S) 56899, 56909, 57307

56913 **(DOE/MC/08216—1440-Vol.2) Simulator for unconventional gas resources multi-dimensional model SUGAR-MD. Volume II. User's manual.** Sawyer, W.K. (Science Applications, Inc., Morgantown, WV (USA)). Sep 1983. Contract AM21-78MC08216;AP21-82MC21490. 160p. NTIS, PC A08/MF A01. Order Number DE84000307.

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SUGAR-MD is a general purpose, two-dimensional reservoir simulator for gas reservoirs. It is extremely versatile in that it can be used to study fractured reservoirs and will efficiently solve one- or two-dimensional problems in either cartesian or polar cylindrical coordinates. Although three-dimensional arrays are used in the code in its present form, all testing and debugging have been done using only two dimensions. Some changes would be necessary, such as the determination of bottomhole pressures and/or rate allocations for multi-node wells, to extend the model for complete three-dimensional capability. The model consists of 27 subroutines which are invoked as needed to perform the necessary I/O operations and specialized calculation procedures.

0304 Products And By-products

REFER ALSO TO CITATION(S) 56914

0306 Marketing And Economics

REFER ALSO TO CITATION(S) 57251

56914 **(DOE/R4/10088—T1) Liquefaction of remote sources of natural gas. Final report.** Rogers, D.W. (Production Management Co., Lexington, KY (USA)). Dec 1981. Contract FG44-80R410088. 38p. NTIS, PC A03/MF A01. Order Number DE84000373.

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The objective was to determine the technical and financial feasibility of liquefying remote reserves of natural gas and transporting the liquefied product to users. The proposed methodology included efforts to (1) identify any prohibitive or limiting laws and/or regulations; (2) identify sufficient unutilized reserves in remote areas to justify further investigation; (3) identify existing portable liquefaction equipment (or an interested manufacturer that could supply the needed equipment) to obtain cost and performance data; (4) determine site preparation, supply and production costs for use in assessing economic feasibility; and (5) identify potential users. The conclusion is that the liquefaction of natural gas in remote areas of Appalachia is not economically feasible as long as an adequate and reliable supply of pipeline gas is perceived to be available for the forseable future and the price per Btu of pipeline gas remains so far below other fuels. 3 tables.

0307 Waste Management

REFER ALSO TO CITATION(S) 56975

0308 Environmental Effects

REFER ALSO TO CITATION(S) 56851

56915 **(UCID—19075-Vol.1) LLNL/NWC 1980 LNG spill tests. Burro series data report.** Koopman, R.P.; Baker, J.; Cederwall, R.T.; Goldwire, H.C. Jr.; Hogan, W.J.; Kamppinen, L.M.; Kiefer, R.D.; McClure, J.W.; McRae, T.G.; Morgan, D.L. (Lawrence Livermore National Lab., CA (USA)). Dec 1982. Contract W-7405-ENG-48. 290p. NTIS, PC A13. Order Number DE84000921.

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During the summer of 1980, the Burro series of liquefied natural gas (LNG) spill experiments were performed at the Naval Weapons Center (NWC), China Lake, California. These experiments involved eight spills of LNG and one of liquid nitrogen, each of approximately 40 m^3, onto water. A large array of instruments was used to make measurements of gas concentration, temperature, humidity, heat flux from the ground, and turbulence within the dispersing gas cloud. A separate instrument array made measurements of the wind field both upwind of the spill and over the area in which the gas was dispersing. This report contains the data from these tests with an explanation of how and where the data were taken and the reliability of the instruments used to take it. It does not include analysis of the data, other than that which is necessary to understand the reliability of the data. Data analysis will be covered in a series of other reports.

0309 Artificial Stimulation

REFER ALSO TO CITATION(S) 57756

56916 **(DOE/MC/16333—1448) Stress trajectory and advanced hydraulic-fracture simulations for the Eastern Gas Shales Project. Final report, April 30, 1981-July 30, 1983.** Advani, S.H.; Lee, J.K. (Ohio State Univ., Columbus (USA). Dept. of Engineering Mechanics). 1983. Contract AC21-81MC16333. 143p. NTIS, PC A07/MF A01. Order Number DE83017036.

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A summary review of hydraulic fracture modeling is given. Advanced hydraulic fracture model formulations and simulation, using the finite element method, are presented. The numerical examples include the determination of fracture width, height, length, and stress intensity factors with the effects of frac fluid properties, layered strata, in situ stresses, and joints. Future model extensions are also recommended. 66 references, 23 figures.

56917 **(UCRL—89890) Western Gas Sands subprogram at Lawrence Livermore National Laboratory.** Heuze, F.E. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 10p. (CONF-8310162—8). NTIS, PC A02/MF A01. Order Number DE84001435.

From Western gas sands sub-program review meeting; Morgantown, WV, USA (18 Oct 1983).

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The Western Gas Sands (WGS) Subprogram at Lawrence Livermore National Laboratory (LLNL) is a part of the LLNL Unconventional Gas Program. It is an integrated effort of field oriented tasks, laboratory measurements, and computer modeling which uses the field and laboratory information. The WGS subprogram has two objectives: to quantify geologic factors which control hydrofracture propagation such as geologic discontinuities (orientation and spacing), in-situ stresses, and geologic material properties; and to develop and verify numerical models of fracture propagation in complex geologic media. The main results achieved in FY 1983 are: (1) the completion of a feasibility study to map fractures by seismic reflection from boreholes; (2) an analysis of how faults and joints affect hydraulic fracture orientations, and a prediction for maximum horizontal stress direction at the Multiwell (MWX) site; (3) the successful completion of a feasibility study of using S-wave anisotropy in boreholes to measure in-situ stress; (4) a comparison of various methods for stress estimates at MWX; (5) the completion and documentation of laboratory mechanical properties testing on Mesaverde sandstones and shales; (6) a comparison of tight gas sands mechanical properties obtained by various field and laboratory methods; (7) a correlation study of in-situ stresses vs mechanical properties which revealed striking relationships; (8) the completion and documentation of a 2-D coupled model for in-plane hydrofracture propagation; (9) the development of a 3-D in-plane hydrofracture model based on a new variational principle, using velocities; and (10) the acquisition and enhancement of a 2-D arbitrary fracture propagation code for complex media. 21 references, 7 figures, 3 tables.

0330 Properties

REFER ALSO TO CITATION(S) 56847

0340 Combustion

REFER ALSO TO CITATION(S) 57488, 57489, 57490, 57491

04 OIL SHALES AND TAR SANDS

0401 Reserves And Exploration

REFER ALSO TO CITATION(S) 56924

56918 **Cretaceous and Tertiary history and resources of the Piceance Creek basin, western Colorado.** Johnson, R.C.; Keighin, C.W. (Geological Survey, Denver, CO). *Field Conference Guidebook (New Mexico Geological Society);* **32**: 199-210(1981). (CONF-8110216—).

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

The Piceance Creek Basin is a Late Creataceous and Tertiary age sedimentary basin in west-central Colorado. It is bounded on the southeast by the Sawatch uplift, on the east by the White River uplift, on the north by the Uinta uplift, on the southwest by the Uncompahgre uplift, and on the west by the Douglas Creek arch. It is part of a larger complex of Laramide-age basins, including the Uinta Basin to the west and the greater Green River Basin to the north, which hold vast lacustrine oil-shale deposits of Eocene age. This paper is a general overview of the development of the Piceance Creek Basin starting in the Early Cretaceous time. Oil shale, and other resources, are discussed briefly. (JMT)

0402 Site Geology And Hydrology

REFER ALSO TO CITATION(S) 56918

0403 Drilling, Fracturing, And Mining

REFER ALSO TO CITATION(S) 57756

0404 Oil Production, Recovery, And Refining

REFER ALSO TO CITATION(S) 56848, 56920, 56921

56919 **Results of mathematical modeling of modified in-situ oil shale retorting.** Braun, R.L.; Diaz, J.C.; Lewis, A.E. New York, NY; American Institute of Mining, Metallurgical and Petroleum Engineers (1982). 22p. Society of Petroleum Engineers, Dallas, TX 75206. Contract W-7405-ENG-48.

From 57. annual fall technical conference and exhibition of the Society of Petroleum Engineers; New Orleans, LA, USA (26 Sep 1982).

The Lawrence Livermore National Laboratory (LLNL) has developed a one-dimensional mathematical model to simulate modified in situ retorting of oil shale. In this paper we discuss the application of the model to commercial-scale retorting conditions. The model was tested by comparing calculated values to those measured in experimental retort runs performed at LLNL. There was generally good agreement between the calculated and observed results for oil yield, temperature profiles, and the yields of most gas species. Retorting rates were consistently overestimated, although the average error was less than 10%. The model is a useful tool for the design and control of retort operations, and for identifying and interpreting observations that differ from model predictions. The model was used to predict the results for modified in situ retorting on a commercial scale, focusing on larger retorts and larger shale particle sizes than could be investigated experimentally. Retort bed properties, particularly shale composition and particle size, play an

important role in determining the fraction of oil that can be recovered. For a given shale composition, the inlet-gas properties can be selected to help control retort operations and maximize oil yield. Extreme variations in oil shale grade that may be encountered as a function of depth can be dealt with by appropriate changes in the composition and flow rate of the inlet gas. In addition, we show that using oxygen diluted with steam or carbon dioxide can make significant improvements in the heating value of the effluent gas. Finally, we demonstrate the feasibility of retorting through a substantial interval of very low-grade shale. 24 references, 20 figures, 3 tables.

0405 Properties And Composition

REFER ALSO TO CITATION(S) 57289

0406 Direct Uses And By-products

REFER ALSO TO CITATION(S) 56848

0409 Waste Research And Management

56920 **(DOE/LC/10639—T1) Application of gas flotation and foam separation for the treatment of tar-sand wastewaters.** Boardman, G.D.; Nolan, B.T.; VanLeigh, L. (Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Civil Engineering). Mar 1983. Contract AS20-81LC10639. 166p. NTIS, PC A08/MF A01. Order Number DE84001331.

A feasibility study was undertaken to evaluate the potential of air flotation and foam separation for the treatment of tar sand, steam generation waste waters collected following an in-situ experiment in Vernal, Utah. It was found that the process waters were not amenable to treatment by means of polymer-aided air flotation or foam separation. Suspended solids were readily removed by the process, but dissolved organic substances were not affected significantly.

56921 **Ignition and combustion behavior of spent shale particles.** Manor, Y.; Suuberg, E.M.; Ho, M.; Toor, H.L. (Carnegie-Mellon Univ., Pittsburgh, PA). *Symposium (International) on Combustion, [Proceedings]*; 1093-1103(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

This study examines the ignition and burning of chars left after pyrolysis of 5-cm dia. oil shale samples. The experiments modeled in-situ retorting by minimizing radiation. The effects of shale grade (from 83 to 183 liter/tonne), retorting temperature (600 to 756 K), and combustion gas composition (5 to 21% O_2) were examined. This study confirms the important role of gasification of the char by CO_2 released from decomposition of carbonate minerals and explores the transition to that mechanism from the initial direct attach of O_2 on char. This transition is normally encountered in combustion of chars produced from rich shales. The role of CO combustion within the rock matrix is also considered. The model is presented which successfully predicts the temperature histories and conversions of the spent shales, as well as the change from the direct oxidation mechanism to the gasification mechanism described above.

0410 Enviromental Aspects

REFER ALSO TO CITATION(S) 56851

05 NUCLEAR FUELS

0501 Reserves

56922 (INIS-mf—8575, pp vp) **Mineralogical studies of the uranium vein type together with sulfides parageneses in Iran.** Espahbod, M. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

56923 **(N—8322677) Uranium.** (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 19p. NTIS, PC A05/MF A01.

In Energy Resources in New Mexico, p 60-78 (SEE N83-22672 12-42).

Reserves are uranium resources which occur in known deposits of such grade, quality, configuration, and depth that they are recovered at a cost less than an equal or fixed value through the use of the state of the art mining and processing technologies. Uranium reserves are classified according to categories based on the maximum cost required to extract a pound of uranium concentrate (U308). Uranium mines and mill capacity were also discussed.

56924 **Western Slope Colorado.** Epis, R.C.; Callender, J.F. (eds.). Socorro, NM; New Mexico Geological Society, Inc. (1981). 337p. (CONF-8110216—).

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

A conference on the geology and geologic resources of the Western Slope of western Colorado and eastern Utah is presented. Fourteen papers from the conference have been abstracted and indexed for the Department of Energy's Energy Data Base. These papers covered such topics as uranium resources, oil shale deposits, coal resources, oil and gas resources, and geothermal resources of the area. (JMT)

56925 **Uranium-vanadium deposits of the Uravan mineral belt and adjacent areas, Colorado and Utah.** Chenoweth, W.L. (Dept. of Energy, Grand Junction, CO). *Field Conference Guidebook (New Mexico Geological Society);* **32**: 165-170(1981). (CONF-8110216—).

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

The Salt Wash Member of the Morrison Formation of Jurassic age contains economic deposits of uranium and vanadium minerals in western Colorado, southeastern Utah, northeastern Arizona, and northwestern New Mexico. These deposits have accounted for nearly 13 percent of the United States' uranium production. The most productive deposits are in a relatively small area in southwestern Colorado that is referred to as this is a referred to as the Uravan mineral belt. Included with the Uravan mineral belt in this overview are the following adjacent areas: Thompson, Moab, La Sal, and Dry Valley. This paper is intended to present a brief overview of the geologic setting of the deposits, to review the geologic investigations, and to summarize the development of the mining industry in the area. (JMT)

56926 **Uranium in the Gunnison county, Colorado.** Goodknight, C.S. (Bendix Field Engineering Corp., Grand Junction, CO). *Field Conference Guidebook (New Mexico Geological Society);* **32**: 183-190(1981). (CONF-8110216—).

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

Approximately 1.2 million kg of uranium oxide (yellow cake) has been produced from the area surrounding Gunnison, Colorado. Over 99 percent of this has come form the Cochetopa and Marshall Pass districts. Uranium in both districts and many of the other occurrences is associated closely with fault and shear zones which cut brittle host formations (sandstones and dolomites) of Paleozonic and Mesozoic age. Minor uranium occurrences are in pegmatites and shear zones in Precambrian rocks, Cambrian vein material, and sandstones of Tertiary age. In the paper presented, the uranium occurences are described by districts. In addition, possibilities for additional discoveries are discussed. (JMT)

0502 Exploration

REFER ALSO TO CITATION(S) 56924, 56926, 57444

56927 (GJBX—36(83)) Assessment of quality of data on tapes from the hydrogeochemical and stream sediment reconnaissance. National Uranium Resource Evaluation. Brock, D.; Averett, W.R. (Bendix Field Engineering Corp., Grand Junction, CO (USA)). Sep 1983. Contract AC13-76GJ01664. 27p. NTIS, PC A03/MF A01. Order Number DE83017697.

This report contains the results of limited assessment of the quality of data on tapes that were generated by Los Alamos National Laboratory, Oak Ridge Gaseous Diffusion Plant, Lawrence Livermore National Laboratory, and Savannah River Laboratory as part of their participation in the Hydrogeochemical and Stream Sediment Reconnaissance (HSSR), one of the elements of the National Uranium Resource Evaluation. The assessment was limited to verification of file content and detailed examination of each file in search of deviations from stated formats, missing data, missing or incorrect coordinates for sample sites, duplication of data, coding errors, unreadable data, data out of range of valid parameters, and other apparent problems that may contribute to difficulty in reading and understanding the data. The purpose of this report is to assist users of HSSR data tapes who have specific problems with particular tapes or who want to know if they are likely to have problems. More than 500 tapes were evaluated. About half of them had discrepancies of some sort, ranging from probably trivial to probably very significant, but rarely were the accumulation and nature of discrepancies enough to suggest that the usefulness of some segment of the data might be in question. The chemical analytical data were subject to fewer discrepancies than the field data. The data base as a whole appears to be generally retrievable and understandable.

56928 Radon measurement techniques for uranium exploration. Pacer, J.C. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 495-504 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

Radon is an alpha-emitting gas produced in the radioactive decay of uranium. Because of its unique physical and nuclear properties, radon can be easily measured by numerous techniques to assist in uranium exploration. Radon is measured either directly by detecting the alpha emission from the gas fraction of a sample or indirectly by detecting the radioactive decay products of radon. The direct measurement techniques involve either the pumping of gas into a scintillation or ionization chamber, or the passive migration of soil gas into inverted cups containing alpha track, thermoluminescence, or electronic alpha detectors. The indirect methods involve either gamma or beta measurements of radon's short-lived daughters, bismuth-214 and lead-214, deposited on activated charcoal, or radiochemical analyses of the long-lived daughters, lead-210 and polonium-210. This paper describes and discusses each of these direct and indirect measurement techniques.

56929 Results of radon and helium surveys at three known uranium occurrences. Pacer, J.C.; Czarnecki, R.F. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 517-530 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

Radon and helium measurements in near-surface soil were performed over detailed (1.5 km^2) and subregional (40 km^2) areas at three known uranium occurrences. The detailed survey results at these sites indicated anomalously high radon and helium concentrations which appeared to correspond to the known mineralization at depth. The radon and helium patterns for the subregional areas at two sites were different, and did not indicate the known mineralization. The radon patterns were controlled by lithology and the radium concentration of the soil. Anomalous helium areas were related to structure. At the third site, the radon and helium patterns over the subregional area, though different, were basically mapping lithology, and the known deposit appeared as a subtle anomaly for both radon and helium. Since radon located the deposit for both detailed and subregional sampling surveys at this site, core from the surface to the deposit was analyzed for extractable polonium-210, a long-lived decay product of radon. These measurements indicated that radon does not migrate very far from its source.

56930 Drilling-mud emanometer. Czarnecki, R.F.; Pacer, J.C. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 557-571 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

Bendix Field Engineering Corporation, as part of the United States Department of Energy National Uranium Resource Evaluation (NURE) program, has investigated the feasibility of measuring radon in recirculating drilling mud to determine whether radon variations in the mud would be useful for uranium exploration. To implement this program, a prototype drilling-mud emanometer system was developed and tested. The system works by degassing the drilling mud as it recirculates, and continuously measuring the radon activity of the evolved gas as a function of time. This radon activity can then be related to borehole depth. Operational tests of the prototype system were conducted at two drilling sites. At these sites, it was found that radon can be measured in the recirculating mud and that anomalous radon zones can be correlated with uranium concentrations and variations in lithology. The method may also make it possible to detect the presence of nearby uranium concentrations not indicated by gamma-ray logs.

56931 Importance of the magnetic method in uranium exploration in the Copper Mountain and Grants Districts, USA. Pigott, J.A. (St. Joe American Corporation, Tucson, AZ (USA)); Farley, W.G.; Emilia, D.A. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 591-604 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

The Copper Mountain Wyoming uranium district, is characterized by a broad, positive magnetic anomaly. Magnetic modeling indicates that this anomaly is generated by magnetic minerals in the granite. Several uranium deposits in the district, notably the Fuller deposit, are characterized by strong positive magnetic anomalies. Magnetic susceptibility logs and petrographic studies of core indicate that a close association exists between uranium and magnetite at the Fuller deposit. Airborne apparent resistivity data indicate that uranium mineralization is also frequently associated with closed resistivity lows or sharp resistivity gradients, which appear to be related to high fracture density in the granite. Combined resistivity and magnetic data appear to identify potential uranium deposits in the districts. A high-sensitivity aeromagnetic survey was conducted over an area where a uranium deposit was recently discovered in the Grants mineral belt New Mexico; it is located in the Jurassic Morrison Formation, at a depth of approximately 610-730 m. The detrended aeromagnetic data reveal a 12 gamma low coinciding with the deposit. A magnetic field model in combination with seismic reflection data suggest that the magnetic low is caused by a graben-like structure in the Precambrian basement. This structure is present sympathetically in the Morrison Formation and appears to have influenced uranium deposition. The study indicates that a high sensitivity magnetic survey can help to locate relatively deep, structurally controlled uranium deposits in the San Juan Basin.

56932 Total count gamma-ray logging: correction factors and logging model grade assignments. George, D.C. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 729-752 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

A unified approach is developed to the inter-related problems of calibration, grade assignment, and log reduction. Factors

common to all three problems are dead time, water-filled or mud-filled hole size, casing thickness, Z-effect (or photoelectric absorption-effect), and formation moisture. Dead time for most logging systems is a function of count rate rather than a constant as usually assumed, and a better method can be used to correct for dead time. Z-effect is significant for some tools in zones having concentrations as low as 0.1 percent eU_3O_8, and a method is developed to measure the magnitude of the Z-effect. The method used to compute area under a log is significant in some calibration models because corrections must be made for count-rate contributions from the barren zones. A calibration procedure is developed for simultaneously determining calibration factors needed for dead-time corrections, Z-effect corrections, and grade computation (K-factor). The procedure is based on a least-squares solution and can be implemented on programmable calculators. Field measurements are referenced to calibrations commonly done in logging models having assigned grades; and the assigned grades of logging models are referenced to radiometric assays, made in the laboratory, on physical samples from the models. Conditions which differ from field to logging model, and logging model to laboratory (especially moisture) must be taken into account.

56933 **Direct-uranium logging: neutron-based techniques.** Duray, J.R. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)). pp 807-810 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

The development and subsequent transfer to the uranium industry of a proven neutron-based direct-uranium borehole logging technique are reviewed. Delayed fission neutrons or prompt fission neutrons are used and the two techniques are comparable.

56934 **Review of magnetic susceptibility logging and its application to uranium exploration.** George, D.C. (Bendix Field Engineering Corporation, Grand Junction, CO (USA)); Scott, J.H. (United States Geological Survey Denver, CO (USA)). pp 837-856 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

Borehole measurement of magnetic susceptibility can show anomalies associated with mineralization or alteration. The detection of small anomalies is necessary, so efforts have been made in recent years to improve the sensitivity and the stability of magnetic susceptibility logging tools. Typical tools contain a single coil constructed as a solenoid wound on ferrite rods about 30cm long. The coil is heated to a constant temperature to reduce drift, and careful design is necessary to optimize temperature control and to maximize sensitivity. Measurements of coil resistance and inductance, which indicate conductivity and susceptibility, are made using a Maxwell bridge circuit. Circuit analysis shows that conductivity measurements are difficult and that stringent requirements are placed on phase stability of measurement circuitry. Corrections to the observed log are necessary to account for borehole size. The response of the tool to a thin zones of anomalous susceptibility is double peaked and a set of curves has been developed for interpretation. Calibrations of the tools are made by measuring the tool's response in models of known susceptibility.

56935 **Uranium exploration technology developments under the U.S. NURE program.** Ball, L. (U.S. Department of Energy, Grand Junction, CO (USA)). pp 859-874 of Proceedings of the symposium on uranium exploration methods. Paris, France; OECD (1982). (CONF-8206164—).

From Symposium on uranium exploration methods; Paris, France (1 Jun 1982).

The U.S. National Uranium Resource Evaluation (NURE) program was initiated in 1974 to assess uranium resources in all states except Hawaii. This assessment involved a systematic program to gather and analyze aerial, surface, and subsurface data. At the outset of the NURE program, the adequacy of existing exploration and data-interpretation techniques was examined. Based upon the results of these examinations, technology development activities were conducted to improve observed shortcomings and to provide methods for enhancing the determination of favorability of geologic environments for uranium and for delineating uranium deposits. This paper summarizes the results of these activities, categorized as follows: Aerial Surveying Techniqes, Surface Exploration Techniques, Subsurface Exploration Techniques, Technology Integration, Calibration Facilities, Laboratory and Technical Support. For each category, technology development activities are described, and the new developments resulting from the period 1974-1981 are discussed. The NURE program was determinated in fiscal year 1981, and, in fiscal year 1982, most of the remaining unpublished data will be publicly released.

0503 Mining

REFER ALSO TO CITATION(S) 56925

0504 Feed Processing

56936 **(MINTEK-M—37) Literature survey of the metallurgical aspects of minerals in Witwatersrand gold ores.** De Waal, S.A. (Council for Mineral Technology, Randburg (South Africa)). 13 Aug 1982. 46p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703730.

This survey reviews the information in the literature on the auriferous rock formations in the Witwatersrand-Orange Free State gold-mining area, the gold-bearing horizons, and the mineralogy and petrography of the different ore types. The metallurgical aspects of the gold, silver, uranium, platinum-group elements, cobalt, nickel, copper, and chromite in these ores are examined and, on the strength of this information, a list is given of those problems in metallurgical extraction that are of a mineralogical nature. Finally, a number of research projects, aimed to support current research at the Council for Mineral Technology, are suggested.

56937 **Long-term potential of uranium recovery from H_3PO_4.** Hurst, F.J.; Posey, F.A. (Oak Ridge National Lab., TN). pp 184-194 of Sulfuric/phosphoric acid plant operations, 1982. New York, NY; American Insititute of Chemical Engineers (1982). Contract W-7405-ENG-26.

Approximately one-half of the current US phosphoric acid production capacity is being treated in six phosphate plants to recover over 3 million lb of U_3O_8 per year. The unrecovered half is contained in phosphoric acid produced in 15 plants from which the economics of recovery are less favorable. Our current research program is aimed at improving the efficiency of the process in order to make uranium recovery more cost effective and thereby increase the potential for commercialization. This paper takes a critical look at several unit operations and steps involved in uranium recovery where problems exist and where process efficiency may be improved. The most promising area where a significant cost reduction may be possible is removal of dissolved oxygen from the organic extract before it enters the reductive stripping system. This can lead to more efficient stripping, smaller stripping units, and can minimize problems of iron contamination.

0507 Fuels Production And Properties

56938 **(DOE/ET/37873—1) Advanced geometric modeling systems - ROMULUS, TIPS, PADL-2 and SYSTRID: applications to the fuel fabrication process. Final report.** Holden, A.D.C. (Washington Univ., Seattle (USA)). Jan 1982. Contract AT06-80ET37873. 14p. NTIS, PC A02/MF A01. Order Number DE84001070.

Portions are illegible in microfiche products.

This report outlines the essential features of four advanced geometric modeling systems, compares them, and indicates their potential for increasing productivity in computer-aided design, computer-aided manufacturing, and robotics. The author visited the laboratories at Cambridge, England, Cornell University, and General Motors Research and Development, Warren, Michigan, where these systems are being developed. Each of the systems discussed shows considerable promise for industrial use in the near future. However, the TIPS system which is currently available is one of

the few with a system to produce a finite element representation of a solid from the solid geometry primitive representation used for input. TIPS also allows sculptured surfaces and can communicate with FORTRAN. Thus, useful analytical programs can be written to interface with the finite element model. The author is currently modifying TIPS for use on the VAX 11/780 and its operation has been demonstrated.

56939 **(INIS-BR—53) Behaviour of (Th, U)O_2 microspheres under compression tests and pelletization.** Ferreira, R.A.N. (Minas Gerais Univ., Belo Horizonte (Brazil). Escola de Engenharia). Dec 1982. 98p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83781125.

The interrelation between the behaviour of isolated microspheres in compression tests and the microstructure of sintered pellets obtained with these microspheres, was investigated. Various batches of (Th, 5 w/o U)O_2 microspheres were produced applying the so-called gel process. The production parameters were diversified both as to the composition and to the heat treatments. The resulting products underwent compression tests in an universal tension and compression machine as single microspheres and, as bulk material, were compacted and sintered. The results of the compression tests revealed the existence of two distinct classes of fragmentation behaviour. Each of these classes causes a distinct behaviour during the pelletization, too, resulting in fuel pellets with quite different microstructures. It was evidenced that there is a relationship between these differences in the microstructure and the behaviour of the single microspheres in the compression test.

56940 (INIS-mf—8575, pp vp) **U^{+4} phosphates.** Belova, L.; Gorshkov, A.; Ivanova, O.; Sivtsov, A. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

56941 **(KFK—3473) Constitution of the Mo-Ru-Rh-Pd and UO_2-ZrO_2-MoO_2-BaO systems and their correlation with the precipitates of fission products in irradiated fuels.** Paschoal, J.O.A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter; Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau). Mar 1983. 179p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751111.

Isothermal sections at 1700°C have been investigated in the metallic Mo-Ru-Rh, Mo-Ru-Pd, Mo-Rh-Pd, Ru-Rh-Pd, and Mo-Ru-Rhsub(0.5)Pdsub(0.5) systems and in the ceramic UO_2-ZrO_2, UO_2-BaO, ZrO_2-BaO, MoO_2-BaO, UO_2-ZrO_2-BaO, $BaUO_3$-$BaZrO_3$-$BaMoO_3$, and MoO_2-$BaUO_3$-$BaZrO_3$ systems. In addition, the phase diagrams of the binary Ru-Rh system between 900 and 2340°C and of the binary Mo-Pd system between 850 and 1550°C were established.

56942 **(LA-UR—83-2613) Air-stable reference material for measurement of the oxygen-to-metal (O/M) ratio of nuclear fuel.** Hammond, C.F.; Honnell, R.E.; Rein, J.E. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 6p. (CONF-831025—2). NTIS, PC A02/MF A01. Order Number DE84001347.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

As a reference material for the oxygen-to-metal (O/M) ratio of nuclear oxide fuel, pellets prepared by calcining powder blends of titanium suboxide and thorium oxide in hydrogen atmosphere have desirable features of controllable O/M-ratio values, long-term stability in air, absence of plutonium, and high resistance to fracture. Under the conditions of the O/M-ratio measurement method of heating 800 to 900°C in an atmosphere of 6% hydrogen - 94% helium containing water vapor, the titanium suboxide oxidizes stoichiometrically to titanium dioxide. Pellets have been prepared having O/M-ratio values equivalent to values of 1.94 to 1.98 for 3/1 uranium/plutonium mixed-oxide fuel, and have been used effectively for calibration and quality-control surveillance of an automated, predictive-thermogravimetric analyzer being developed by the Hanford Engineering Development Laboratory.

0508 Spent Fuels Reprocessing

REFER ALSO TO CITATION(S) 56959, 56961, 56962, 56963, 57978

56943 **(INIS-mf—8198) Statement of the incidents that occurred during operation of the reprocessing plant in Cap de la Hague in consideration of their reasons, development and effects.** Heider; Schmidt. (Kerntechnische Gesellschaft e.V., Hannover (Germany, F.R.). Ortssektion Hannover-Braunschweig). Nov 1981. 27p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83781107.

The nature of the incidents in the years 1978 until May 1981 and their effects are described. Compared with other chemical plants this one is a quite ordinary facility the attention of which keeps to be drawn to the public only because of the nuclear material.

56944 (INIS-mf—8537, pp vp) **Computer code for calculation of solvent-extraction separation in a multicomponent system with reference to nuclear fuel reprocessing.** Carassiti, F.; Liuzzo, G.; Morelli, A. (Rome Univ. (Italy). Ist. di Chimica Applicata e Industriale). 1982. NTIS (US Sales Only), PC A24/MF A01. (CONF-8209154—Vol.1).

From 3. Austrian-Italian-Yugoslav chemical engineering conference and 276. meeting of the European Federation of Chemical Engineering; Graz, Austria (14 Sep 1982).

Nuclear technology development pointed out the need for a new assessment of the fuel cycle back-end. Treatment and disposal of radioactive wastes arising from nuclear fuel reprocessing is known as one of the problems not yet satisfactorily solved, together with separation process of uranium and plutonium from fission products in highly irradiated fuels. The aim of this work is to present an improvement of the computer code for solvent extraction process calculation previously designed by the authors. The modeling of the extraction system has been modified by introducing a new method for calculating the distribution coefficients. The new correlations were based on deriving empirical functions for not only the apparent equilibrium constants, but also the solvation number. The mathematical model derived for calculating separation performance has been then tested for up to ten components and twelve theoretical stages with minor modifications to the convergence criteria. Suitable correlations for the calculation of the distribution coefficients of uranium, plutonium, nitric Acid and fission products were constructed and used to successfully simulate several experimental conditions.

56945 **(KFK—3533) Experience gained from the operation of two α-monitors in "PUTE".** Groll, P.; Persohn, M.; Roeder, L.; Roemer, J.; Schuler, B. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Heisse Chemie; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Wiederaufarbeitung und Abfallbehandlung). Apr 1983. 35p. (PWA—99/82). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751166.

The operation of two α-monitors of the "drum-cell"-type in the plutonium facility "PUTE" is described. The instruments were installed in the AW- and the BW-stream. After a short description of the monitor, the different operating modes and of installation details, the experience gained from two weeks of continuous operation is described. The advantages of the use of in-line-instruments compared with laboratory analyses of samples are discussed. The instruments were available for 97 or 94% of the time.

56946 **(KFK—3544) Time-dependent modelling of an iodine-filtering facility.** Nagel, K.; Furrer, J. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Datenverarbeitung in der Technik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 2; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Apr 1983. 18p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751150.

Passat a test facility to remove iodine isotopes and aerosols from dissolver off-gas of a large reprocessing plant is located at the Nuclear Research Center Karlsruhe. For the purposes of time-de-

pendent modelling of the iodine-filtering part of Passat the experimental results have been described by mathematical functions. Assuming that a planned reprocessing plant of about 350 tons per year uses the present dissolution process of the reprocessing plant Karlsruhe (WAK), we are able to describe the time-dependence of iodine released by the dissolver. The change of the off-gas temperature is given as a function of time: - behind the HEPA-filter after failure of heater W3, - behind the iodine-sorption-filter after failure of heater W4, as well as after failures of W3 and W4. The transmission factor of the iodine-sorption-filter is dependent on filter bed bepth and realtive humidity of the off-gas as well as on bed depth and NO_2-concentration. Based on exponential functions it was possible to describe satisfactorily these two 2-dimensional dependences.

56947 (PNCT—841-82-19) Calculation code PULCO for Purex process in pulsed column. Gonda, K.; Matsuda, T. (Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). Mar 1982. 367p. (In Japanese). NTIS (US Sales Only), PC A16/MF A01. Order Number DE83703715.

The calculation code PULCO, which can simulate the Purex process using a pulsed column as an extractor, has been developed. The PULCO is based on the fundamental concept of mass transfer that the mass transfer within a pulsed column occurs through the interface of liquid drops and continuous phase fluid, and is the calculation code different from conventional ones, by which various phenomena such as the generation of liquid drops, their rising and falling, and the unification of liquid drops actually occurring in a pulsed column are exactly reflected and can be correctly simulated. In the PULCO, the actually measured values of the fundamental quantities representing the extraction behavior of liquid drops in a pulsed column are incorporated, such as the mass transfer coefficient of each component, the diameter and velocity of liquid drops in a pulsed column, the holdup of dispersed phase, and axial turbulent flow diffusion coefficient. The verification of the results calculated with the PULCO was carried out by installing a pulsed column of 50 mm inside diameter and 2 m length with 40 plate stage in a glove box for unirradiated uranium-plutonium mixed system. The results of the calculation and test were in good agreement, and the validity of the PULCO was confirmed.

0509 Transport And Storage

REFER ALSO TO CITATION(S) 57502, 57505

56948 (SAND—82-2365) Assessment of the safety of spent fuel transportation in urban environs. Sandoval, R.P.; Weber, J.P.; Levine, H.S.; Romig, A.D.; Johnson, J.D.; Luna, R.E.; Newton, G.J.; Wong, B.A.; Marshall, R.W. Jr.; Alvarez, J.L. (Sandia National Labs., Albuquerque, NM (USA); Lovelace Foundation for Medical Education and Research, Albuquerque, NM (USA). Inhalation Toxicology Research Inst.; Idaho National Engineering Lab., Idaho Falls (USA)). Jun 1983. Contract AC04-76DP00789. 111p. NTIS, PC A06/MF A01. Order Number DE84001629.

The results of a program to provide an experimental data base for estimating the radiological consequences from a hypothetical sabotage attack on a light-water-reactor spent fuel shipping cask in a densely populated area are presented. The results of subscale and full-scale experiments in conjunction with an analytical modeling study are described. The experimental data were used as input to a reactor-safety consequence model to predict radiological health consequences resulting from a hypothetical sabotage attack on a spent-fuel shipping cask in the Manhattan borough of New York City. The results of these calculations are presented.

56949 (SAND—83-1656C) Nationwide transportation control system. Mora, K.; Cover, R.K. (USDOE Albuquerque Operations Office, NM; Sandia National Labs., Albuquerque, NM (USA)). Aug 1983. Contract AC04-76DP00789. 21p. (CONF-8308122—1). NTIS, PC A02/MF A01. Order Number DE83017155.

From North American Data General Users Group conference; Toronto, Ontario, Canada (30 Aug 1983).

The Department of Energy's Transportation Control System is a tool for managing the interstate transportation of government-owned nuclear material in a safe and secure way. The system is discussed in a general way since it is classified.

56950 (UCID—19834) Spent Fuel Test - Climax data acquisition system operations manual. Nyholm, R.A. (Lawrence Livermore National Lab., CA (USA)). Jan 1983. Contract W-7405-ENG-48. 201p. NTIS, PC A10/MF A01. Order Number DE84001371.

Portions are illegible in microfiche products; Includes 11 sheets of 48x reduction microfiche.

The Spent Fuel Test-Climax (SFT-C) is a test of the retrievable, deep geologic storage of commercially generated, spent nuclear reactor fuel in granite rock. Eleven spent fuel assemblies, together with 6 electrical simulators and 20 guard heaters, are emplaced 420 m below the surface in the Climax granite at the US Department of Energy Nevada Test Site. On June 2, 1978, Lawrence Livermore National Laboratory (LLNL) secured funding for the SFT-C, and completed spent fuel emplacement May 28, 1980. The multi-year duration test is located in a remote area and is unattended much of the time. An extensive array of radiological safety and geotechnical instrumentation is deployed to monitor the test performance. A dual minicomputer-based data acquisition system (DAS) collects and processes data from more than 900 analog instruments. This report documents the software element of the LLNL developed SFT-C Data Acquisition System. It defines the operating system and hardware interface configurations, the special applications software and data structures, and support software.

0520 Waste Management

REFER ALSO TO CITATION(S) 56950, 56976, 56977, 56978, 56979, 56980, 56981, 56982, 56983, 56984, 56985, 56986, 56987, 56989, 57136, 57358, 57423, 57431, 57755, 58010

56951 (BNL—33675) Waste form development/test. Kalb, P.D.; Colombo, P. (Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-76CH00016. 12p. (CONF-8308106—14). NTIS, PC A02/MF A01. Order Number DE84001158.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

The main objective of this study is to investigate new solidification agents relative to their potential application to wastes generated by advanced high volume reduction technologies, e.g., incinerator ash, dry solids, and ion exchange resins. Candidate materials selected for the solidification of these wastes include a modified sulfur cement and low-density polyethylene, neither of which are currently employed commerically for the solidification of low-level waste (LLW). As both the modified sulfur cement and the polyethylene are thermoplastic materials, a heated screw type extruder is utilized in the production of waste form samples for testing and evaluation. In this regard, work is being conducted to determine the range of conditions under which these solidification agents can be satisfactorily applied to the specific LLW streams and to provide information relevant to operating parameters and process control.

56952 (CONF-8308106—17) Shallow Land Burial Technology - Humid. Davis, E.C.; Spalding, B.P.; Lee, S.Y. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE84000343.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

The Shallow Land Burial Technology - Humid Project is being conducted for the Department of Energy Low-Level Waste Management Program with the objective of identifying and demonstrating improved technology for disposing of low-level solid waste in humid environments. Two improved disposal techniques are currently being evaluated using nine demonstration trenches at the Engineered Test Facility (ETF). The first is use of a cement-bentonite grout applied as a waste backfill material prior to trench closure and covering. The second is complete hydrologic isolation of waste

by emplacement in a trench that is lined on all four sides, top and bottom using synthetic impermeable lining material. An economic analysis of the trench grouting and lining demonstration favored the trench lining operation ($1055/demonstration trench) over trench grouting ($1585/demonstration trench), with the cost differential becoming even greater (as much as a factor of 6 in favor of lining for typical ORNL trenches) as trench dimensions increase and trench volumes exceed those of the demonstration trenches. In addition to the evaluation of trench grouting and lining, major effort has centered on characterization of the ETF site. Though only a part of the overall study, characterization is an extremely important component of the site selection process; it is during these activities that potential problems, which may obviate the site from further consideration, are found. Characterization of the ETF has included studies of regional and site-specific geology, the physical and chemical properties of the soils in which the demonstration trenches are located, and hydrology of the small watershed of which the ETF is a part. 12 references, 6 figures, 2 tables.

56953 **(DOE/ID/12371—5) Acquisition of public lands for disposal of low-level radioactive waste.** Dawson, J.H. (Colorado Office of the Governor, Denver (USA)). Sep 1983. Contract FG07-82ID12371. 23p. NTIS, PC A02/MF A01. Order Number DE84001147.

It is clear that the Federal Land Policy Management Act (FLPMA) gives broadly extended statutory authority to the Bureau of Land Management (BLM) to effect public land transactions. For the purposes of this study, the focus will be on an examination of the boundaries of BLM's powers to effect the exchange and sale of public lands. In the course of examining these powers, consideration will be given also to certain limitations inherent in the statutes which may delay implementation of BLM powers and the consequent effective transfer of public lands. The principal reason for possible delay is the FLPMA requirement for land use planning. Other delay sources could be the requirement for fair market value and the increased prospect of third party judicial challenge. Finally, some consideration will be given to alternative approaches such as the Federal Asset Management Program, the Recreation and Public Purposes Act and State selection of lands.

56954 **(DOE/LLW—6Tg) Directions in low-level radioactive waste management. Low level-radioactive waste disposal: currently operating commercial facilities.** (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1983. Contract AC07-76ID01570. 22p. NTIS, PC A02/MF A01. Order Number DE84001638.

This publication discusses three commercial facilities that receive and dispose of low-level radioactive waste. The facilities are located in Barnwell, South Carolina; Beatty, Nevada; and Richland, Washington. All three facilities initiated operations in the 1960s. The three facilities have operated without such major problems as those which led to the closure of three other commercial disposal facilities located in the United States. The Beatty site could be closed in 1983 as a result of a Nevada Board of Health ruling that renewal of the site license would be inimical to public health and safety. The site remains open pending federal and state court hearings, which began in January 1983, to resolve the Board of Health ruling. The three sites may also be affected by NRC's 10 CFR Part 61 regulations, but the impact of those regulations, issued in December 1982, has not yet been assessed. This document provides detailed information on the history and current status of each facility. This information is intended, primarily, to assist state officials - executive, legislative, and agency - in planning for, establishing, and managing low-level waste disposal facilities. 12 references.

56955 **(DOE/NE—0017/2) Spent fuel and radioactive waste inventories, projections, and characteristics.** (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 312p. NTIS, PC A14/MF A01. Order Number DE84001618.

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Current inventories and characteristics of commercial spent fuels and both commercial and US Department of Energy radioactive wastes were compiled through December 31, 1982, based on the most reliable information available from government sources and the open literature, technical reports, and direct contacts. Future waste and spent fuel to be generated over the next 40 years and characteristics of these materials are also presented, based on the latest DOE/EIA projection of US commercial nuclear power growth and expected defense-related and industrial and institutional activities. Materials considered, on a chapter-by-chapter bases, are: spent fuel, high-level waste, transuranic waste, low-level waste, active uranium mill tailings, airborne waste, remedial action waste, and decommissioning waste. For each category, current and projected inventories are given through the year 2020, and the radioactivity and thermal power are calculated, based on reported or calculated isotopic compositions. One chapter gives broad, summary data on the costs of spent fuel and radioactive waste management and disposal to provide an economic perspective. This chapter is not intended as a definitive guide, but it is a source of reasonable, order-of-magnitude costs and also provides references to more-detailed and scenario-specific studies. An appendix on generic flowsheets and source terms used for the projections is also included.

56956 **(DP—83-125-1) Waste management program technical progress report, January-March 1983.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Sep 1983. Contract AC09-76SR00001. 165p. NTIS, PC A08/MF A01. Order Number DE84001210.

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This quarterly report provides current information on operations and development programs for the management of radioactive wastes from operation of the Savannah River Plant and offplant participants. The studies on environmental and safety assessments, other support, in situ storage or disposal, waste form development and characterization, process and equipment development, airborne nuclear waste dispersion, and the Defense Waste Processing Facility are a part of the Long-Term Waste Management Technology Program. The following studies are reported for the Savannah River Interim Waste Operations: surveillance and maintenance, waste concentration, low-level effluent waste, tank replacement/waste transfer, waste engineering, and solid waste storage and related activities.

56957 **(DP—1606-Rev.1) Description of Defense Waste Processing Facility reference waste form and canister. Revision 1.** Baxter, R.G. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). Aug 1983. Contract AC09-76SR00001. 69p. NTIS, PC A04/MF A01. Order Number DE84001627.

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The Defense Waste Processing Facility (DWPF) will be located at the Savannah River Plant in Aiken, SC, and is scheduled for construction authorization during FY-1984. The reference waste form is borosilicate glass containing ~ 28 wt % sludge oxides, with the balance glass frit. Borosilicate glass was chosen because of its high resistance to leaching by water, its relatively high solubility for nuclides found in the sludge, and its reasonably low melting temperature. The glass frit contains about 58% SiO_2 and 15% B_2O_3. Leachabilities of SRP waste glasses are expected to approach 10^{-8} g/m^2-day based upon 1000-day tests using glasses containing SRP radioactive waste. Tests were performed under a wide variety of conditions simulating repository environments. The canister is filled with 3260 lb of glass which occupies about 85% of the free canister volume. The filled canister will generate ~ 470 watts when filled with oxides from 5-year-old sludge and 15-year-old supernate from the sludge and supernate processes. The radionuclide content of the canister is about 177,000 ci, with a radiation level of 5500 rem/h at canister surface contact. The reference canister is fabricated of standard 24-in.-OD, Schedule 20, 304L stainless steel pipe with a dished bottom, domed head, and a combined lifting and welding flange on the head neck. The overall canister length is 9 ft 10 in. with a 3/8-in. wall thickness. The 3-m canister length was selected to reduce equipment cell height in the DWPF to a practical size. The canister diameter was selected as an optimum size from glass quality considerations, a logical size for repository handling and to ensure that a filled canister with its double containment shipping cask could be accommodated on a legal-weight truck. The overall dimensions and weight appear to be compatible with preliminary assessments of repository requirements. 10 references.

56958 **(DP-MS—83-88) Greater Confinement Disposal Program at the Savannah River Plant.** Towler, O.A.; Cook, J.R.; Peterson, D.L. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 9p. (CONF-8308106—8). NTIS, PC A02/MF A01. Order Number DE84000828.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

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Plans for improved LLW disposal at the Savannah River Plant include Greater Confinement Disposal (GCD) for the higher activity fractions of this waste. GCD practices will include waste segregation, packaging, emplacement below the root zone, and stabilizing the emplacement with cement. Statistical review of SRP burial records showed that about 95% of the radioactivity is associated with only 5% of the waste volume. Trigger values determined in this study were compared with actual burials in 1982 to determine what GCD facilities would be needed for a demonstration to begin in Fall 1983. Facilities selected include 8-feet-diameter x 30-feet-deep boreholes to contain reactor scrap, tritiated waste, and selected wastes from offsite.

56959 **(EUR—7934) Characterization of released radionuclides in the gas phase during cutting and dissolution of irradiated fuel elements of CANDU type reactors at EUREX pilot plant.** Alonzo, G.; Castellani, F.; Curzio, G.; Gentili, A.; Pieve, L. (Commission of the European Communities, Luxembourg). 1982. 80p. (In Italian). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703714.

This article deals with measurements on off-gas during reprocessing of Pickering spent fuel elements. On-line equipment, samplers and analysis systems are described. Airborne particulates collected on filters and iodine 129 collected on impregnated charcoal are analyzed by gamma spectrometry, krypton 85 is analyzed by on-line gamma counting and tritium by radiochromatography. Activity and concentration are given for each isotope during mechanical process and dissolution and for the gaseous effluent in the different sampling points. Results are compared with activity in the spent fuel calculated by the ORIGEN code.

56960 (GSF-R—290, pp 350-375) **Hydrogeologic and hydrologic investigations in connection with the underground disposal of radioactive wastes.** Stempel, C.V.; Batsche, H. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In order to permit an assessment of the sometimes very long storage periods occurring in connection with final disposals and of the consequences resulting in the case of an eventual failure, the migration behaviour of selected radionuclides was investigated in the strata of the surface rock masses sourrounding the respective salt stocks. Our Institute performed the corresponding activities in three districts: In the area of the former salt mine Asse II a hydrogeologic research programme is realized in close cooperation with the GSF Institut fuer Tieflagerung, Braunschweig. Within the scope of the Projekt Sicherheitsstudien Entsorgung (PSE) the required investigations are carried out in the district of the salt stock Gorleben. Within the scope of a NAGRA project, isotope-hydrological measurements were taken up in connection with investigations on the storage of radioactive waste materials in crystalline rocks of Switzerland.

56961 (IAEA-SR—72, pp 327-347) **Iodine removal from the vessel off gas in Tokai reprocessing plant.** Fukushima, M.; Miyahara, K.; Matsumoto, K. (Power Reactor and Nuclear Fuel Development Corp., Tokai, Ibaraki (Japan). Tokai Works). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/25).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

Through the active operation of Tokai reprocessing plant started on Sep. 1977, the measurements of iodine (^{129}I) in the liquid and gaseous streams have been carried out. From the result of measurements, it was confirmed that more than 99% of the calculated amount of ^{129}I in the spent fuels was released into the off gas circuit during the dissolution. Most of the released iodine was desorbed to liquid streams and then transferred to the waste disposal facility, where some amounts of iodine were released into the vessel off gas line. Through the investigation of iodine distribution in the plant, it was understood that the removal of iodine in the vessel off gas led to decreasing the iodine discharged to the atmosphere, so that the charcoal and the silver-exchanged zeolite (AgX) filters were installed in the vessel ventilation systems at the waste disposal facility. Then the removal tests have been carried out through the active operation. The decontamination factor (DF) of the charcoal filter for iodine (^{129}I) achieved about 10^3 at the beginning but the breakthrough occurred at 1,100 hours loading. On the other hand, DF of AgX filter has been kept in the range of 50 to 10^2 through 18,000 hours loading (about two years since the start of operation in Nov. 1979). Consequently, it was confirmed that AgX adsorbent was effective for the removal of airborne iodine (^{129}I) in the vessel off gas. At present, by means of the installation of AgX filters on the vessel ventilation systems, the iodine (^{129}I) discharged to the atmosphere has been controlled at low level in the Plant.

56962 (IAEA-SR—72, pp 592-618) **Dissolver off-gas cleaning in reprocessing plants: testing and operation of mist eliminators, HEPA and iodine filters.** Furrer, J.; Linek, A.; Kaempffer, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik I); Merz, A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Isotopentechnik). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/16).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

A dissolver off-gas filter section with remotely handled filter components was designed, built and has been operated on trial since 1978 as a prototype for the head-end of a reprocessing plant; it attains a decontamination factor $>=10^5$ for droplet aerosols and particulates. It was supposed that about 0.1% of the α-emitters of the dissolved, cut fuel is carried away as aerosols and more than 99% of the fission product iodine are transported as gas in the off-gas. The major components of the filter system for dissolver off-gas cleaning, PASSAT, include: the simulation system for the dissolver off-gas throughput 50-250 msub(n)^3/h, with the feeds for vapor, aerosols (droplets and particulates), nitric oxides and iodine; the wave plate separator for droplets >10 μm; the fiber pack mist eliminator (remotely operated) for mist elimination; the HEPA filter (remotely operated) for the removal of salt particles; and the two series-connected iodine sorption filters equipped with the inorganic iodine sorption material AC 6120 (remotely operated).

56963 (IAEA-SR—72, pp 619-624) **Off gas filtration system in fuel reprocessing plants - engineering design approach based on operating experience.** Pandya, G.J. (Bhabha Atomic Research Centre, Bombay (India). Fuel Reprocessing Div.). May 1983. NTIS (US Sales Only), PC A99/MF A01. (CONF-8205206—; IAEA-SR—72/24).

From Seminar on the testing and operation of off-gas cleaning systems at nuclear facilities; Karlsruch, F.R. Germany (3 May 1982).

A few observations are made based on an overview of the experience over several years of operation of the off gas filtration systems in the Fuel Reprocessing Plants in India. Broad profiles of the nature of problem areas are indicated emphasising the need to accord at design stage due care and consideration to such relatively conventional aspects as filter containers, off gas exhausters, coolers/chillers, demisters, vibration isolators, condensate drainage and logistics of filter cartridge replacement.

56964 **(KFK—3241) Investigations of the alpha radiolysis of LAW/MAW-bitumen products containing radioactive waste from reprocessing.** Kowa, S.; Kerner, N.; Hentschel, D.; Kluger, W. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Entsorgungstechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Wiederaufarbeitung und Abfallbehandlung). Apr 1983. 18p. (In German). (PWA—62/82). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751145.

10 g samples of Cm_2O_3 and PuO_2 bitumen waste products were enclosed in glass ampulles in air under standard pressure and ambient temperature. The samples were internally irradiated to alpha doses of $1.0x10^8$ rad up to $2.4x10^9$ rad. The irradiation period was 1 to 2.5 years. After irradiation up to the dose mentioned, the ampulles were opened in an evacuated equipment and the gasvolumes were measured in a gas burette by means of a "Toepler pump". The composition of the gases was determined by gas chromatography. Main component of the alpha irradiated bitumen products is hydrogen. The average H_2-output is of the order of 1.2 ml/g product and 10^8 rad, which corresponds to a $G(H_2)$-value of 0.47. This value is by a factor 2.7 higher, compared to the average H_2-output of gamma-ray irradiation and a 10 MeV-electron external irradiation of bitumen/$NaNO_3$ products.

56965 **(KFK—3428) Nuclear-technical investigations in the R+D-project "analysis of the suitability of the iron ore mine Konrad for disposal of radioactive wastes".** Torres, M.; Bechthold, W.; Hauser, W.; Johnson, P.; Kienzler, B.; Kluger, W.; Koester, R.; Rudolph, G.; Smailos, E.; Vejmelka, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Entsorgungstechnik). Mar 1983. 95p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751140.

The report contains the results of the investigations which were performed by KfK/INE in the R+D-project "Analysis of the Suitability of the Iron Ore Mine Konrad for the Disposal of Radioactive Wastes". The analyses was conducted for the disposal of radioactive wastes from nuclear power plants, nuclear research centres, from the use of isotopes in science, medicine and industry and from the decommissioning of nuclear facilities. These wastes are described in view to their type and amount and to their behaviour under conditions likely to be encountered in transport, handling and disposal. The different containers for the wastes are presented and their resistance against corrosion is discussed on the basis of experimental results. For the operational phase of the repository the radiation dose to the personnel resulting from handling of the waste packages is estimated. For the post-operational phase the migration of radionuclides in the galleries of the repository after an assumed intrusion of water and subsequent leaching of the wastes is calculated.

56966 **(KFK—3438) Corrosion studies on non-metallic inorganic materials for HLW packaging design.** Storch, W.; Engelke, H.; Smailos, E. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Entsorgungstechnik). Feb 1983. 54p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751275.

Within the framework of our studies to find out suitable materials for developing HLW packaging with a barrier function in a salt repository the corrosion behavior was investigated of non-metallic inorganic materials under specified hypothetical accident conditions. Moreover glass solders to be used as connecting materials between canister and lid as an alternative closing technique have been tested for their corrosion behavior. The corrosion studies on ceramic materials and glass solders are performed in a quinary salt brine (Q-brine) at temperatures between 80 and 200°C and a pressure of 130 bar. The investigations have confirmed that some materials show a high corrosion resistance. The highest corrosion resistance was exhibited by the Al_2O_3 material. It decisively depends on the purity, the structure and the surface finish of the material. The glasses investigated at 200°C showed that the chemically resistant glass 8330 (19 μm/a at 200°C) and an HLW model glass with adapted dilatation coefficient (86 μm/a) exhibit a good resistance to corrosion. The results obtained so far have shown that development of HLW packaging with a barrier function in the repository can be generally achieved with the use of ceramic materials.

56967 **(LA-UR—83-2589) Shallow land burial technology - ARID.** Abeele, W.V.; DePoorter, G.L.; Hakonson, T.E.; Nyhan, J.W. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 15p. (CONF-8308106—15). NTIS, PC A02/MF A01. Order Number DE84001358.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

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Scope of the tasks being performed by Los Alamos will be identified. Emphasis will be placed upon the geotechnical work. Important geotechnical properties of a low-level waste disposal site include hydraulic conductivity consolidation, and shear strength of the applicable medium. The hydraulic conductivity of crushed Bandelier tuff has been assessed using the instantaneous profile method. The best fit of hydraulic conductivity as a function of water content was found to be a power function. The coefficient of consolidation was difficult to measure because of the relatively high hydraulic conductivity. The repose angle for crushed tuff is higher than the normally expected range. This is probably because of a higher than average angularity and surface roughness. The high coefficient of consolidation and high internal friction angle make finely crushed tuff a material with ideal mechanical characteristics. The drawback is that a high coefficient of consolidation is linked to a high hydraulic conductivity.

56968 **(LBL—15010) Appraisal of nuclear waste isolation in the vadose zone in arid and semiarid regions (with emphasis on the Nevada Test Site).** Wollenberg, H.A.; Wang, J.S.Y.; Korbin, G. (Lawrence Berkeley Lab., CA (USA)). May 1983. Contract AC03-76SF00098. 135p. NTIS, PC A07/MF A01. Order Number DE84001066.

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An appraisal was made of the concept of isolating high-level radioactive waste in the vadose zone of alluvial-filled valleys and tuffaceous rocks of the Basin and Range geomorphic province. Principal attributes of these terranes are: (1) low population density, (2) low moisture influx, (3) a deep water table, (4) the presence of sorptive rocks, and (5) relative ease of construction. Concerns about heat effects of waste on unsaturated rocks of relatively low thermal conductivity are considered. Calculations show that a standard 2000-acre repository with a thermal loading of 40 kW/acre in partially saturated alluvium or tuff would experience an average temperature rise of less than 100°C above the initial temperature. The actual maximum temperature would depend strongly on the emplacement geometry. Concerns about seismicity, volcanism, and future climatic change are also mitigated. The conclusion reached in this appraisal is that unsaturated zones in alluvium and tuff of arid regions should be investigated as comprehensively as other geologic settings considered to be potential repository sites.

56969 **(ORNL/TM—8695) Evaluation of the ORNL area for future waste burial facilities.** Lomenick, T.F.; Byerly, D.W.; Gonzales, S. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 33p. NTIS, PC A03/MF A01. Order Number DE84001583.

Additional waste-burial facilities will be needed at ORNL within this decade. In order to find environmentally acceptable sites, the ORNL area must be systematically evaluated. This document represents the first step in that selection process. Geologic and hydrologic data from the literature and minor field investigations are used to identify more favorable sites for Solid Waste Storage Area (SWSA) 7. Also underway at this time is a companion study to locate a Central Waste Storage Area which could be used in the future to accommodate wastes generated by the X-10, Y-12, and K-25 facilities. From the several watershed options available, the Whiteoak Creek drainage basin is selected as the most promising hydrologic regime. This area contains all past and present waste-disposal facilities and is thus already well monitored. The seven bedrock units within the ORNL area are evaluated as potential burial media. Shales of the Conasauga Group, which are currently used for waste burial in the Whiteoak Creek drainage basin, and the Knox Group are considered the leading candidates. Although the residuum derived from and overlying the Knox dolomite has many favorable characteristics and may be regarded as

having a high potential for burial of low-level wastes, at the present it is unproven. Therefore, the Conasauga shales are considered a preferable option for SWSA 7 within the ORNL area. Since the Conasauga interval is currently used for waste burial, it is better understood. One tract in Melton Valley that is underlain by Conasauga shales is nominated for detailed site-characterization studies, and several other tracts are recommended for future exploratory drilling. Exploration is also suggested for a tract in the upper Whiteoak Creek basin where Knox residuum is the shallow subsurface material.

56970 (PNL-SA—11648) Monitoring land and water uses in the Columbia Plateau using remote-sensing computer analysis and integration techniques. Leonhart, L.S.; Wukelic, G.E.; Foote, H.P.; Blair, S.C. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 16p. (CONF-830847—4). NTIS, PC A02/MF A01. Order Number DE84001415.

From Energy resource management '83; San Francisco, CA, USA (23 Aug 1983).

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This study successfully utilized advanced, remote-sensing computer-analysis techniques to quantify and map land- and water-use trends potentially relevant to siting, developing, and operating a high-level national, nuclear waste repository on the US Department of Energy's Hanford Site in eastern Washington State. Specifically, using a variety of digital data bases (primarily multidate LANDSAT data) and digital analysis programs, the study produced unique numerical data and integrated data reference maps relevant to regional (Columbia Plateau) and localized (Pasco Basin) hydrologic considerations associated with developing such a facility. Because all study data developed are in digital form, they can be called upon to contribute to future reference repository location monitoring and reporting efforts, as well as to be utilized in other US Department of Energy programmatic areas having technical and/or environmental interest in the Columbia Plateau region. The results obtained indicate that multidate digital LANDSAT data provide an inexpensive, up-to-date, and accurate data base and reference map of natural and cultural features existing in any region. These data can be (1) computer enhanced to highlight selected surface features of interest; (2) processed/analyzed to provide regional land cover/use information and trend data; and (3) combined with other line and point data files to accommodate interactive, correlative analyses and integrated colorgraphic displays to aid interpretation and modeling efforts. Once the digital base is established, selected site information can be assessed immediately, various forms of data can be accessed concurrently or separately, and data sets may be displayed or mapped at any scale. Available editing software provides the opportunity to generate credible scenarios for a site while preserving the actual data base. 6 references.

56971 (RLO/SFM—82-7) Surplus Facilities Management Program: methodology for establishing decommissioning priorities. (UNC Nuclear Industries, Inc., Richland, WA (USA). Office of Surplus Facilities Management). Jun 1982. Contract AC06-76RL01857. 61p. NTIS, PC A04/MF A01. Order Number DE83017116.

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The purpose of this document is to describe the process that the Surplus Facilities Management Program (SFMP) uses to establish and periodically re-evaluate the program priorities and budgets for decommissioning projects. This process consists of two phases. In the first phase, six factors are evaluated for each project. These factors are: DOE legal and contractual requirements; economic impact of immediate versus delayed decommissioning; health risk of delayed decommissioning; future site plans; cost effective program management; and other special factors that may be unique to individual projects. Each of the six factors is fully described.

56972 (SAND—82-2711) 1982 Subseabed Disposal Program. Annual report, site assessment October 1981 to September 1982. Shephard, L.E. (ed.). (Sandia National Labs., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 291p. NTIS, PC A13/MF A01. Order Number DE84000996.

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The Site Assessment Program is continuing its evaluation of marine geological formations in conjunction with Subseabed Disposal Program efforts to evaluate the technical, environmental, and engineering feasibility for disposing of high-level radioactive waste. Currently, site assessment efforts are focused on 3 candidate locations in the North Pacific and 4 locations in the North Atlantic. 1982 Site Assessment activities, summarized in this document, emphasized completing the analyses of data collected on Vema 36-12, preparing for and successfully completing drilling in the PAC 1 region, and continuing cooperative efforts with the international NEA/SWG Site Selection Task Group in the North Atlantic.

56973 (SAND—82-7221) Laboratory tests to determine hydraulic and thermal properties of bentonite-based backfill materials. Peterson, E.; Kelkar, S. (Terra Tek, Inc., Salt Lake City, UT (USA)). Sep 1983. Contract AC04-76DP00789. 69p. NTIS, PC A04/MF A01. Order Number DE84001143.

Terra Tek Research has conducted a testing program on a variety of backfill mixtures to evaluate their thermal and hydraulic properties under conditions expected to be representative of a nuclear waste repository in a deep salt formation. Backfill mixtures were produced by combining bentonite clay with a number of different solid materials, primarily silica sand and crushed salt, in a variety of proportions. Generally, samples were compacted to specified densities, after which appropriate properties were determined. Thermal conductivity and hydraulic conductivity as functions of composition, density and temperature were the principal material properties determined in this program. Additional measurements were performed to determine gas permeability of several mixtures, time-dependent axial deformation of bentonite, water loss from bentonite at elevated temperatures, viscosity of synthetic heavy brines used, and grain size distribution of sands used in the program. Program tests are shown in tabular form which include backfill mixture compositions, test conditions and descriptions of data collected during each test. Measured sand size grain distributions are presented in Appendix A. A discussion of gas (nitrogen) permeability theory and data collected is in Appendix B. A detailed technical discussion of the transient technique of thermal conductivity measurement is given in Appendix C. Brine viscosity data are presented in Appendix D.

56974 Forced cooling of a nuclear waste repository mine drift - a scoping analysis. Boyd, R.D. (Sandia National Labs., Albuquerque, NM (USA)). *Nuclear Engineering and Design;* **73**: No. 3, 405-410(Dec 1982).

Nuclear waste repositories, with decay heat generation beneath the mine drift floors, are force-cooled with air so that re-entrance is possible many years after the waste has been buried. A numerical model has been developed which uses heat transfer coefficients as input. It has been demonstrated that mixed (forced and free) convective and surface roughness effects are significant and must be included in future experiments if reliable predictions are to be made of the time required to cool the repository. For example, when repository mine drifts in volcanic tuff are force-cooled, with forced convection being the only energy transport mechanism, it takes approx.= 0.1 year to cool the mine surface to a safe temperature. However, when mixed convection is the primary transport mechanism it takes approx.= 1.0 year to cool the mine. In addition to mixed convection, other effects are delineated.

56975 Material equations for rock salt under mechanical and thermal load including treatment of boundary value problems by the finite element method. Olschewski, J.; Stein, E.; Wagner, W.; Wetjen, D. Hannover, Germany, F.R.; Hannover University (1981). vp. (In German). Available from Hannover Univ. (Germany, F.R.). Lehrgebiet fuer Baumechanik.

This paper is a first step in the development of thermodynamically consistent material equations for inelastic materials, such as polycrystalline rock salt. In this context it is of particular importance to reduce the number and the structure of the internal variables, in order to allow for a fit with available experimental data. As an example this is demonstrated in detail in the case of the so-called dislocation model. As physical non-linearities and in addition also

geometrical non-linearities lead to an inhomogeneous deformation - and stress state even in the case of simple samples, boundary value problems have to be studied, in order to test the material equations. For this purpose the finite element method has been used.

0530 Environmental Aspects

REFER ALSO TO CITATION(S) 56970, 56989, 57650

56976 **(DOE/EIS—0096-F-Vol.1) Remedial actions at the former Vitro Rare Metals plant site, Canonsburg, Washington County, Pennsylvania. Final Environmental Impact Statement. Volume I.** (Department of Energy, Washington, DC (USA)). Jul 1983. 366p. NTIS, PC A16/MF A01. Order Number DE84001446.

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The environmental impacts associated with remedial actions in connection with residual radioactive materials remaining at the inactive uranium processing site located in Canonsburg, Washington County, Pennsylvania are evaluated. The Canonsburg site is an 18.5-acre property that was formerly owned by the Vitro Rare Metals Company. The expanded Canonsburg site would be 30-acre property that would include the Canonsburg site (the former Vitro Rare Metals plant), seven adjacent private houses, and the former Georges Pottery property. During the period 1942 through 1957 the Vitro Manufacturing Company and its successor, the Vitro Corporation of America, processed onsite residues and ores, and government-owned ores, concentrates, and scraps to extract uranium and other rare metals. The Canonsburg site is now the Canon Industrial Park. In addition to storing the residual radioactive materials of this process at the Canonsburg site, about 12,000 tons of radioactively contaminated materials were transferred to a railroad landfill in Burrell Township, Indiana County, Pennsylvania. This Canonsburg FEIS evaluates five alternatives for removing the potential public health hazard associated with the radioactively contaminated materials. In addition to no action, these alternatives involve various combinations of stabilization of the radioactively contaminated materials in place or decontamination of the Canonsburg and Burrell sites by removing the radioactively contaminated materials to another location. In addition to the two sites mentioned, a third site located in Hanover Township, Washington County, Pennsylvania has been considered as a disposal site to which the radioactively contaminated materials presently located at either of the other two sites might be moved.

56977 **(DOE/EIS—0096-F-Vol.2-App.) Remedial actions at the former Vitro Rare Metals plant site, Canonsburg, Washington County, Pennsylvania. Final Environmental Impact Statement. Volume II. Appendices.** (Department of Energy, Washington, DC (USA)). Jul 1983. 421p. NTIS, PC A18/MF A01. Order Number DE84001443.

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This report provides a summary of the conceptual design and other information necessary to understand the proposed remedial action at the expanded Canonsburg, Pennsylvania site. This design constitutes the current approach to stabilizing the radioactively contaminated materials in place in a manner that would fully protect the public health and environment. This summary is intended to provide sufficient detail for the reader to understand the proposed remedial action and the anticipated environmental impacts. The site conceptual design has been developed using available data. In some cases, elements of the design have not been developed fully and will be made final during the detailed design process.

56978 **(DOE/UMT—0215) Physical stability of asphalt emulsion admix seal radon barrier for uranium mill tailings.** Gates, T.E. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 42p. (PNL—4846). NTIS, PC A03/MF A01. Order Number DE84001635.

Pacific Northwest Laboratory, is investigating the use of an asphalt emulsion admix seal to reduce the release of radon from uranium mill tailings. A key requirement of any cover system is its long-term stability; the cover must withstand failure over very long periods of time. An important determinant of overall cover system stability is the integrity of the 6.35-cm (2.5-in.) thick asphalt admix seal. Therefore, the physical stability of this seal was examined. The investigation considered the mechanical interaction between the tailings pile and cover. The potential effect of differential settlement of the tailings pile on the integrity of the seal system was also examined. Results indicate that the minimum span length the seal could withstand without failing is 0.34 m (1.1 ft). This assumes a differential settlement of 4.92 cm (1.94 in.) at the center resulting from the application of a 0.76-m (2.5-ft) cover. At spans greater than 0.60 m (1.97 ft), no tensile strain would develop.

56979 **(DP-MS—83-89-Rev.) Migration studies at the Savannah River Plant shallow land burial site.** Stone, J.A.; Oblath, S.B.; Hawkins, R.H.; Emslie, R.H.; Ryan, J.P. Jr.; King, C.M. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 23 Sep 1983. Contract AC09-76SR00001. 15p. (CONF-8308106—19-Rev.). NTIS, PC A02/MF A01. Order Number DE84001622.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

Radionuclide migration from the Savannah River Plant low-level waste burial ground was studied in ongoing programs that provide generic data on a shallow land burial site in a humid region and support local waste disposal operations. Field, laboratory, and theoretical work continued in four areas. (1) Subsurface Monitoring: Groundwater around the burial ground was monitored for traces of radioactivity and mercury. (2) Lysimeter Tests: Gamma-emitting radionuclides were identified by sensitive methods in defense waste lysimeter percolate waters. Results from these and other lysimeters containing tritium, I-129, or Pu-239 sources are given. (3) Soil-Water Chemistry: Experiments on specific factors affecting migration of Cs-137 showed that potassium significantly increases cesium mobility, thus confirming observations with trench waters. Distribution coefficients for ruthenium were measured. (4) Transport Modeling: Efforts to refine and validate the SRL dose-to-man model continued. Transport calculations were made for tritium, Sr-90, Tc-99, and TRU radionuclides. 12 references, 3 tables.

56980 **(EGG—1183-2419) Annotated bibliography for biologic overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada.** Collins, E.; O'Farrell, T.P.; Rhoads, W.A. (EG and G, Inc., Goleta, CA (USA). Energy Measurements Group). Dec 1981. Contract AC08-83NV10282. 48p. NTIS, PC A03/MF A01. Order Number DE84000864.

This annotated bibliography was compiled to accompany the Biologic Overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada, EG and G, Santa Barbara Operations Report No. EGG 1183-2443, which documents and synthesizes important biotic information related to Nevada Nuclear Waste Storage Investigations (NNWSI). As such, it is an important part of the NNWSI screening process that was designed to include a systematic, traceable, defensible, and documented basis for a decision to proceed or not with site-specific phases on NTS. Included are all published, and available but unpublished, baseline information on life histories, habitat requirements, distributions, and ecological relationships of the flora and fauna of the region. Special effort was made to include information on endangered, threatened, or sensitive species. 131 references.

56981 **(EGG—1183-2460) Biologic overview for the Nevada Nuclear Waste Storage Investigations, Nevada Test Site, Nye County, Nevada.** Collins, E.; O'Farrell, T.P.; Rhoads, W.A. (EG and G, Inc., Goleta, CA (USA). Energy Measurements Group). Jan 1982. Contract AC08-83NV10282. 55p. NTIS, PC A04/MF A01. Order Number DE84000863.

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The Nevada Nuclear Waste Storage Investigations project study area includes five major vegetation associations characteristic of the transition between the northern extent of the Mojave Desert and the southern extent of the Great Basin Desert. A total of 32 species of reptiles, 66 species of birds, and 46 species of mammals are known to occur within these associations elsewhere on the

Nevada Test Site. Ten species of plants, and the mule deer, wild horse, feral burro, and desert tortoise were defined as possible sensitive species because they are protected by federal and state regulations, or are being considered for such protection. The major agricultural resources of southern Nye County included 737,000 acres of public grazing land managed by the Bureau of Land Management, and 9500 acres of irrigated crop land located in the Beatty/Oasis valleys, the Amargosa Valley, and Ash Meadows. Range lands are of poor quality. Alfalfa and cotton are the major crops along with small amounts of grains, Sudan grass, turf, fruits, and melons. The largest impacts to known ecosystems are expected to result from: extensive disturbances associated with construction of roads, seismic lines, drilling pads, and surface facilities; storage and leaching of mined spoils; disposal of water; off-road vehicle travel; and, over several hundred years, elevated soil temperatures. Significant impacts to off-site areas such as Ash Meadows are anticipated if new residential developments are built there to accommodate an increased work force. Several species of concern and their essential habitats are located at Ash Meadows. Available literature contained sufficient baseline information to assess potential impacts of the proposed project on an area-wide basis. It was inadequate to support analysis of potential impacts on specific locations selected for site characterization studies, mining an exploratory shaft, or the siting and operation of a repository.

56982 **(EGG—10282-2004) 1982 biotic survey of Yucca Mountain, Nevada Test Site, Nye County, Nevada.** O'Farrell, T.P.; Collins, E. (EG and G, Inc., Goleta, CA (USA). Energy Measurements Group). Feb 1983. Contract AC08-83NV10282. 47p. NTIS, PC A03/MF A01. Order Number DE84000865.

In 1981 an extensive literature review was conducted to determine the current state of knowledge about the ecological characteristics of the Yucca Mountain study area and to identify what site-specific information was lacking. Based on the findings of the review a field study was initiated in 1982 to gather site-specific information on the ecological characteristics of the project area. The biota observed were representative of either the Mojave or Transition deserts that are widely distributed in southern Nevada and the arid Southwest. No unusual vegetation associations or assemblages of animals were observed. Based on observations of tracks and scats it was concluded that low numbers of both mule deer and feral burros used the area seasonally, and that neither species should be severely threatened by the proposed activities. The Mojave fishhook cactus and desert tortoise, both under consideration for federal protection as threatened species, were found to occur in the study area. The former was distributed in notable densities on the rocky ridgelines of Yucca Mountain in areas that should not be greatly disturbed by site characterization or future repository activities. Evidence of desert tortoise was observed throughout the project area to elevations of 5240 ft; however, relative densities were estimated to be low (less than 20 per square mile). Physical destruction of soils and native vegetation was determined to be the most significant negative effect associated with current and proposed characterization activities. Solution holes in exposed flat rock on ridgelines that served as passive collectors of precipitation and runoff were the only sources of free water observed. While these water supplies were not adequate to support riparian vegetation, there was evidence that they served as an important ephemeral source of water for wildlife.

56983 **(LA-UR—83-2590) Field studies of erosion-control technologies for arid shallow land-burial sites at Los Alamos.** Nyhan, J.W.; Abeele, W.V.; DePoorter, G.L.; Hakonson, T.E.; Perkins, B.A.; Foster, G.R. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 11p. (CONF-8308106—16). NTIS, PC A02/MF A01. Order Number DE84001351.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

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The field research program involving corrective measures technologies for arid shallow land-burial sites is described. Research performed for a portion of this task, the identification, evaluation, and modeling of erosion control technologies, is presented in detail. In a joint study with USDA-ARS, soil erosion and infiltration of water into a simulated trench cap with various surface treatments was measured and compared with data from undisturbed soil surfaces with natural plant cover. The distribution of soil particles in the runoff was measured for inclusion in CREAMS (a field scale model for Chemicals, Runoff and Erosion from Agricultural Management Systems). Neutron moisture gauge data collected beneath the erosion plots are presented to show the seasonal effects of the erosion control technologies on the subsurface component of water balance. 12 references, 4 figures, 4 tables.

56984 **(NUREG/CR—3486) Radiological survey of the Nuclear Fuel Services, Inc. Erwin Plant burial site.** Booth, L.F.; Groff, D.W.; Nyerges, P.L.; Peck, S.I.; Bronson, F.L. (Radiation Management Corp., Northbrook, IL (USA)). Sep 1983. 61p. NTIS, PC A04/MF A01 - GPO $4.50. Order Number DE84900191.

The results of a radiological survey of the burial site on the Nuclear Fuel Services (NFS), Inc. Erwin Plant grounds are presented. This site contains approximately 30 burial pits, into which has been placed a variety of disposable wastes, contaminated with low levels of thorium and uranium, with enrichments ranging from depleted to 97%. Measurements were made to determine if these materials are migrating from the burial pits into the environment, and if so, at what levels. Survey results indicate that contamination is not moving from the pits, and that previous burials of radioactive waste on the site have had little or no effect on the environment.

56985 **(ONWI—505) Proposed nomination of sites for site characterization and recommendation of issues for environmental assessments and site characterization plans. Technical report. Summary of issues and concerns expressed during the April-May 1983 US Department of Energy public hearings.** (Battelle Columbus Labs., OH (USA)). Sep 1983. Contract AC06-76RL01830;AC02-83CH10140. 198p. NTIS, PC A09/MF A01. Order Number DE84001675.

As required by Section 112(b)(2) of the Nuclear Waste Policy Act (Public Law 97-425), the US Department of Energy (DOE) conducted a series of nine formal public hearings during April and May 1983 in local communities in the vicinity of seven identified potentially acceptable salt sites and in the state capitals of the States of Louisiana, Mississippi, Texas, and Utah. The public hearings focused on the proposed nomination of the Vacherie Dome site in Louisiana; the Richton and Cypress Creek Salt Dome sites in Mississippi; the Deaf Smith County and Swisher County bedded salt sites in Texas; and the Davis and Lavender Canyon bedded salt sites in Utah. The issues expressed during area public hearings are summarized in this document, which serves as a digest of and as an index to the public hearing records of each of the four salt states. Specifically, almost 1100 paraphrased public hearing comments are identified and grouped into 62 subjects within the following nine general topical areas: NWTS Program Planning Process, Consultation and Cooperation, Engineering/Repository Design, Geology, Hydrology, Transportation, Public Health and Safety, Environmental Quality, and Socioeconomics.

56986 **(PNL-SA—11475) Tritium in a deciduous forest adjacent to a commercial shallow land burial site: implications for monitoring to detect radionuclide migration.** Rickard, W.H.; Kirby, L.J. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 6p. (CONF-8308106—20). NTIS, PC A02/MF A01. Order Number DE84001413.

From 5. annual participants information meeting of DOE low level waste management program; Denver, CO, USA (30 Aug 1983).

Tritium as tritiated water was measured in the sap taken from the trunks of 26 maple trees growing in the vicinity of the shallow-land, low-level radioactive waste disposal site at Maxey Flats, Kentucky. Tritium values ranged between 10,000 and 290,000 pCi/l with the highest levels measured in sap from trees growing downslope from the burial site's western boundary. Levels of tritium of less than 1000 pCi/l were measured at a distance of 20 kilometers from the site: The source of elevated tritium levels in the vicinity of the disposal site is the evaporator facility which has released tritiated water vapor into the air more or less continuously for 10 years. Another possible source of at least some of the tritium

is subterranean leakage from the trenches located near the western boundary. The evaporator facility has been shut down since December 1982. With the shutdown of the evaporator the levels of tritium in tree sap in future years is expected to show a marked decline as the tritiated soil water in the root zone becomes increasingly diluted with fresh rainwater and the residual tritium is dissipated to the air by evaporation and plant transpiration processes. 11 references.

56987 **(SAND—83-1153) Influence of carbonate complexes on uranium migration through abyssal red clays.** Bunker, B.C.; Erickson, K.L. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 34p. NTIS, PC A03/MF A01. Order Number DE84000685.

Diffusion experiments have been conducted to study the interactions between uranyl carbonate complexes and abyssal red clays. Experimental results indicate that in pH 8.8 solutions containing high concentrations of bicarbonate, uranyl carbonate complexes migrate rapidly through the clay samples. At lower pH values and bicarbonate concentrations, the uranyl carbonate complexes are converted to uranyl hydroxide complexes which are strongly sorbed by the clays and do not migrate. A competitive equilibrium model has been developed which explains these results, and which can be used to define the chemical environments in which uranium migration through the red clays should be rapid. 10 references.

56988 **(SREL—13) Biological inventory of the proposed site of the Defense Waste Processing Facility at the Savannah River Plant in Aiken County, South Carolina. Annual report.** Vitt, L.J.; Semlitsch, R.D.; Cothran, M.L. (Savannah River Ecology Lab., Aiken, SC (USA)). Oct 1982. Contract AC09-76SR00819. 204p. NTIS, PC A10/MF A01. Order Number DE84001792.

Climatological data and the drift fence results from FY-1982 concerning vertebrate census studies are summarized. To facilitate seasonal comparisons, portions of these data are presented with data from past years. Representative important species will be discussed. We summarized our peripheral stream studies, major portions of which were designed and completed during FY-1982. Our findings with respect to potentially threatened or endangered species are presented. Ecological and life history data on some of the more thoroughly studied amphibians are summarized in order to demonstrate the significance of long-term ecological studies to satisfactory environmental assessment. Finally, based on our baseline faunal surveys and concomitant long-term ecological studies, we attempt to predict the biotic consequences of the construction and operation of the proposed DWPF.

0540 Health And Safety

REFER ALSO TO CITATION(S) 56948, 56971, 56976, 56977, 56984, 57200, 57911

56989 **(CONF-820933—8) Simulations of long-term health risk from shallow land burial of low-level radioactive waste.** Little, C.A.; Fields, D.E. (Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 15p. NTIS, PC A02/MF A01. Order Number DE84000675.

From International conference on radioactive waste management; Winnipeg, Manitoba, Canada (12 Sep 1982).

PRESTO (Prediction of Radiation Effects from Shallow Trench Operations) is a computer code developed under U.S. Environmental Protection Agency (EPA) funding to evaluate possible health effects from shallow land burial of low-level radioactive wastes. The model is intended to assess radionuclide transport, ensuing exposure, and health impact to a static local population for up to 1000 years following the end of burial operations. Human exposure scenarios that may be considered by model include normal releases (including leaching and operational spillage), human intrusion, and near site farming. Pathways and processes of transit from the trench to an individual or population include:groundwater transport, overland flow, erosion, surface water dilution, resuspension, atmospheric transport, overland flow, erosion, surface water dilution, resuspension, atmospheric transport, deposition, inhalation, and ingestion of contaminated beef, milk, crops, and water. Off-site population and individual doses and cancer risks may be calculated as well as doses and risks to the intruder and farmer. Data have been compiled for three extant shallow land burial sites: Barnwell, South Carolina; Beatty, Nevada; and West Valley, New York. Some simulation results for the Barnwell site are presented. 13 references, 3 figures, 3 tables.

0550 Regulations

REFER ALSO TO CITATION(S) 57432, 57708

56990 **(KFK—3498) Results of research and development work in 1982 of the Entwicklungsabteilung Kernmaterialsicherung.** (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Entwicklungsabteilung Kernmaterialsicherung). Feb 1983. 9p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751088.

The Development Department for Nuclear Materials Safeguards (EKS) is doing R+D-work on the international safeguards of nuclear materials as part of the Nuclear Materials Safeguards Project and on the national nuclear materials and plant safeguards. The EKS is moreover acting as consulting institution for the BMFT and represents the Federal Republic of Germany in various international boards. The major activities during the past year are discussed in this report.

56991 **De minimis concept from a regulatory standpoint.** Cunningham, G.H. III. pp B39-B53 of Radiation issues for the nuclear industry. Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). (CONF-821077—).

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

The author maintains that the de minimis concept does not have the same legal connotations as a license exemption or a general license, nor is it the same concept as ALARA (as low as reasonably achievable), and to equate this concept with any of the three is erroneous. He discusses the concept with regard to the revision of 10 CFR Part 20 regulations and concludes that incorporating de minimis into Part 20 is preferable to including it in other parts, that legal precedents for doing so exist, and that coordinating with the Environmental Protection Agency is expected in formulating the concept for inclusion in Part 20.

56992 **NRC revision to 10 CFR Part 20.** Baker, R.E.; Cool, W.S.; Mills, W.A. (Nuclear Regulatory Commission, Washington, DC). pp C7-C30 of Radiation issues for the nuclear industry. Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). (CONF-821077—).

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

The Nuclear Regulatory Commission's pollution standards have been revised since publication in the late 1950s, but the basic approach has not changed. The revisions resulted in inaccuracies, conflicts, and ambiguities in requirements. The need for comprehensive updating including radiation-protection principles, risk, occupational exposure dose limits, standards for the public (including de minimis level), surveys and monitoring, disposal into sewerage systems, and records is discussed. 2 tables.

56993 **Radiation protection standards in nuclear-fuel manufacturing.** Nilson, R.; Malody, C.W. (Exxon Nuclear Co., Inc., Richland, WA). pp C39-C61 of Radiation issues for the nuclear industry. Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). (CONF-821077—).

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

The authors discuss principally the impact of changes in 10 CFR 20 on the commercial nuclear-fuel-fabrication industry, for which the impact appears to be the most severe, dwelling on the changes affecting occupational exposures. They conclude that the credibility of the nuclear industry as a comparably safe industry could be harmed by the continuing examination of apparent prob-

lem areas without establishing an overall perspective regarding employee safety. 21 references.

56994 (LA-tr—83-16) Proliferation: does the peaceful use of nuclear energy have to lead to proliferation of nuclear weapons. Muench, E.; Stein, G. Translated from *Energiewirtschaftliche Tagesfragen ;* **32**: No. 7, 571-576(1982). Contract W-7405-ENG-36. 20p. NTIS, PC A02/MF A01. Order Number DE84000420.

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The question of whether the proliferation of nuclear weapons is promoted by an increasing use of peaceful nuclear energy can be answered with a well-founded no. Even a regional renouncing of the peaceful use of nuclear energy would not reduce the worldwide problem of nuclear weapons' proliferation. Therefore, joint efforts must be aimed at promoting trust between peoples in the nuclear sphere and the political reasons for the proliferation of nuclear weapons must be reduced in order also to promote international harmony.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

REFER ALSO TO CITATION(S) 57581

0702 Radiation Sources

REFER ALSO TO CITATION(S) 57712

56995 (INIS-mf—8575, pp vp) **Application of synchrotron radiation in mineralogy.** Calas, G. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

08 HYDROGEN

56996 (PB—83-228254) Abstracts of science and technology in Japan: renewable energy. Volume 3, Number 1, January 1983. (Japan Information Center of Science and Technology, Tokyo). 1983. 51p. NTIS $25.00.

The issue provides English-language summaries of Japanese-language technical papers and reports on non-conventional energy sources. As such, it provides English-readers a window on an otherwise nearly inaccessible body of literature. Topics covered include: Hydro Energy, Solar Energy, Biomass Energy, Geothermal Energy, Ocean Energy, Wind Energy, Energy Storage, Hydrogen Energy, Energy from Wastes and Waste Heat Recovery and Utilization. Other special interest reports are included. Information is provided on how to obtain photocopies and English-language translations of the original articles.

56997 (PB—83-228262) Abstracts of science and technology in Japan: renewable energy. Volume 3, Number 2, April 1983. (Japan Information Center of Science and Technology, Tokyo). 1983. 49p. NTIS $25.00.

The issue provides English-language summaries of Japanese-language technical papers and reports on non-conventional energy sources. As such, it provides English-readers a window on an otherwise nearly inaccessible body of literature. Topics covered include: Hydro Energy, Solar Energy, Biomass Energy, Geothermal Energy, Ocean Energy, Wind Energy, Energy storage, Hydrogen Energy, Energy from Wastes and Waste Heat Recovery and Utilization. Other special interest reports are included. Information is provided on how to obtain photocopies and English-language translations of the original articles. (Copyright (c) by the Japan Information Center of Science and Technology, 1983.)

56998 (PB—83-228270) Abstracts of science and technology in Japan: renewable energy. Volume 3, Number 3, June 1983. (Japan Information Center of Science and Technology, Tokyo). 1983. 50p. NTIS $25.00.

The issue provides English-language summaries of Japanese-language technical papers and reports on non-conventional energy sources. As such, it provides English-readers a window on an otherwise nearly inaccessible body of literature. Topics covered include: Hydro Energy, Solar Energy, Biomass Energy, Geothermal Energy, Ocean Energy, Wind Energy, Energy Storage, Hydrogen Energy, Energy from Wastes and Waste heat Recovery and Utilization. Other special interest reports are included. Information is provided on how to obtain photocopies and English-language translations of the original articles. (Copyright (c) by the Japan Information Center of Science and Technology, 1983.)

0801 Production

REFER ALSO TO CITATION(S) 57458, 57960

56999 (SERI/TP—235-1987) Analysis and modeling of photosynthetic bacterial hydrogen production plants. Herlevich, A. (Solar Energy Research Inst., Golden, CO (USA)). May 1983. Contract AC02-77CH00178. 11p. (CONF-8305137—1). NTIS, PC A02/MF A01. Order Number DE84000003.

From Photo/biological hydrogen annual review meeting; Golden, CO, USA (20 May 1983).

The design of the bacterial reactor can be studied parametrically with the aid of a computer model. This approach is more cost-effective than actually designing and building several reactor configurations. Various geometries can be modeled and their thermal and biological performance determined. The activity should be followed by actual outdoor construction and testing. The thermal performance of the reactor was modeled first, followed by the biological performance. Both have been implemented in a computer program called SOLBUG. SOLBUG accepts hourly solar insolation, wind, and ambient temperature data and calculates the reactor temperature response and hydrogen production. Our materials analysis consisted of incorporating into the earlier study new performance and cost data made available for candidate materials. The overall effect on system performance and cost was determined for two materials (Tedlar and Kynar). Parameters of interest were hydrogen permeability rates, solar transmittance, material lifetime, and cost. System economics using these materials were compared with previously obtained system cost estimates.

57000 Application of intact algae to the biophotolysis problem. Greenbaum, E. (Oak Ridge National Lab., TN). *Biotechnology and Bioengineering Symposium;* No. 12, 469-474(1982). Contract W-7405-ENG-26.

The utilization of intact algae for the simultaneous light-activated production of molecular hydrogen and oxygen is discussed. Experimental data on the long-term stability and endurance of hydrogen and oxygen photoproduction by anaerobically adapted Chlamydomonas reinhardtii is presented. The general conclusion that can be derived from this work is that Chlamydomonas (and probably other microscopic eukaryotic algae) are extremely rugged organisms with respect to the biophotolysis problem. Working with a sample of wild-type Chlamydomonas reinhardtii, the simultaneous photoproduction of hydrogen and oxygen was observed for approximately 100 h. The bleached algae were then removed from the reactor and used as the inoculum in fresh growth medium. These second-generation cells regreened and were able to photoproduce hydrogen and oxygen initially at ten times the rate of the first generation cells and had better survivability characteristics as indicated by their chlorophyll content after 200 h.

0805 Safety

57001 (EUR—8396-EN) Hydrogen safety manual. Balthasar, W.; Schoedel, J.P. (Commission of the European Communities, Luxembourg. Directorate-General for Science, Research and Development). 1983. vp. Commission of the European Communities, Luxembourg.

Hydrogen is a widely used substance. It will gain even wider use if introduced as an energy carrier or if a hydrogen based energy system is developed. Since hydrogen has historically been detected by its explosive behaviour, the increased use of hydrogen could potentially lead to serious safety problems. This manual, therefore, addresses the safety considerations issue by outlining methods, procedures and examples of how to handle hydrogen safely. The objective of this manual is to facilitate safe design and operation of a hydrogen handling system by analysing the properties, explosion behaviour and production methods of hydrogen as well as the problems, operating procedures and component and design procedures of hydrogen plants and handling systems.

09 OTHER SYNTHETIC AND NATURAL FUELS

REFER ALSO TO CITATION(S) 56996, 56997, 56998

0901 Hydrocarbon Fuels

REFER ALSO TO CITATION(S) 57024

57002 (CONF-821257—1) Biomass-energized crop drier. Shaw, L.N.; Post, D.M.; Eoff, K.M. (Florida Univ., Gainesville (USA)). 1982. Contract FG44-80R410299. 6p. NTIS, PC A02/MF A01. Order Number DE84000925.

From American Society of Agricultural Engineers winter meeting; Chicago, IL, USA (14 Dec 1982).

Crop drying is one of the most energy-intensive agricultural operations. The concept of a totally self-contained crop drier energized with biomass such as wood chips was proposed. The concept included the use of a gas producer or gasifier to make fuel gas from biomass for an internal-combustion engine used to drive the drier fan. Since nearly 75% of the energy going into an internal combustion engine is lost in heat carried away in the engine exhaust and the cooling system, it was proposed that most of this energy could be reclaimed if the waste heat from the fan power unit was utilized in heating the drying air. The components of the proposed drier were arranged as shown in Figure 1, with the engine and the gasifier along with the gas cleanup equipment mounted in a duct through which the drying air was drawn before the air entered the bin containing the commodity to be dried. It was invisioned that this biomass energized drier would be used to complement solar crop driers because it could function on cloudy days or at night. This unit might also be used in developing countries where LP gas or fuel oil are in short supply and electricity is not readily available. Results of testing are presented.

57003 (DOE/ER/10855—3) Metal-support interactions: their effects upon adsorption, electronic, and activity/selectivity properties of cobalt in CO hydrogenation. Final progress report, April 1, 1982-September 30, 1983. Bartholomew, C.H. (Brigham Young Univ., Provo, UT (USA). Dept. of Chemical Engineering). 1 Oct 1983. Contract AC02-81ER10855. 14p. NTIS, PC A02/MF A01. Order Number DE84001274.

Measurements of dispersion, extent of reduction, H_2 and CO adsorption stoichiometries, CO hydrogenation activity and selectivity, and H_2 adsorption/desorption kinetics were conducted on 18 catalysts. Hydrogen adsorption was found to be highly activated and quite reversible; the adsorption stoichiometry corresponds to one hydrogen atom per surface cobalt atom. CO adsorption stoichiometries on the other hand vary considerably with support, dispersion, and preparation. Binding energies and adsorption states for H_2 on cobalt vary with support. Activity and selectivity in CO hydrogenation on cobalt vary with support, dispersion, and preparation. The specific activity and selectivity for heavier hydrocarbons decrease with increasing dispersion.

57004 (DOE/R4/10166—T1) Substituted phosphoric acid catalysts for vapor phase reactions in the presence of water vapor. Final report. Pearson, D.E. (Vanderbilt Univ., Nashville, TN (USA)). 1982. Contract FG44-80R410166. 14p. NTIS, PC A02/MF A01. Order Number DE84000668.

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The first two-thirds of the project was devoted to study of the production of ethylene from 80% ethyl alcohol, the composition of the first distillation of fermentation alcohol. The result of this study was the development of an efficient method of preparation which was adaptable to large scale production. Moreover, the ethylene obtained was purer than that obtained by any other method of production. Patent application 306087, Sept. 28, 1981 was submitted to US Patent Office. The claims are described in this report.

57005 (DOE/R4/10169—T1) Investigations for the production of a fermentable feedstock from bagasse using the Purdue cellulose hydrolysis (solvent) system. (Florida Univ., Gainesville (USA). Dept. of Agronomy). Jun 1983. Contract FG44-80R410169. 81p. NTIS, PC A05/MF A01. Order Number DE84000752.

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The major objective is to isolate the cellulosic bundles imbedded in the lignin, and thereafter hydrolyze the isolated cellulosic bundles of alpha and hemi-celluloses into sugars of mono-hexose and pentose, respectively, without significant destruction of these sugars. Two approaches for obtaining the stated goals may be followed: (1) dissolve the lignin without changing the cellulosic fraction. Separate the dissolved lignin from the fibrous bundles and hydrolyze the residual fiber into mono-sugars; and (2) dissolve the cellulosic fraction without dissolving the lignin. Hydrolyze the dissolved cellulosic fraction without interference of lignin into mono-sugars. Remove the non-hydrolyzed lignin which is insoluble in aqueous acid solutions, and thus separate the lignin fraction from the aqueous solution containing the mono-sugars from hydrolyzing. Research was conducted on approach No. 1 using the hydrotropic solution of sodium benzene sulfonate for dissolving lignin from the matrix. Removal of lignin was carried out with the use of a high-pressure, stainless steel Parr vessel. To accomplish the second task, sulfur trioxide was employed as a catalyst to hydrolyze cellulose into liquid mono-sugars. SO_3 when introduced into an air stream at ambient temperature will react with fiber particles and coat them at random with a thin layer of formed H_2SO_4. Abrading of treated fiber can take place in an extruding screw press. The degree of abrading results in a plasticized end product. Hydrolysis of the abraded fibrous material can take place without further addition of acid catalyst in the presence of steam. 5 figures, 14 tables. (DMC)

57006 (DOE/R4/10203—T1) Poultry waste digester. Final progress report. Shih, J.C.H. (Shih (Jason C.H.), Raleigh, NC (USA)). 1983. Contract FG44-80R410203. 5p. NTIS, PC A02/MF A01. Order Number DE84000282.

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A simple and low-cost poultry waste digester (PWD) was constructed at North Carolina State University's Poultry Research Farm at Raleigh, N.C. The PWD system was designed to process a daily output of 600 kg of manure from 4000 caged laying hens. The system consisted of two digesters connected in series, a heating system, a hot water tank, and other metering equipment. The primary and secondary digesters were horizontal cylinders located partially below ground level. They were made of Red Mud plastic lining, supported in the insulated trenches, and covered with insulated roofs. The primary digester volume was 15 m^3 with an 8 m^3 liquid volume and a gas head-space above the liquid. The secondary digester volume was 30 m^3 with a 16 m^3 liquid volume. The temperature (50°C) of the primary digester was maintained by the hot dilution water added with manure and a SolaRoll heating mat laid underneath the plastic lining. The design, operation, performance, energy balance, and economics of the digester are discussed and evaluated in this final progress report.

57007 (DOE/R4/10475—T1) Production of methane gas from organic waste. Holtsberg, F. (Holtsberg (Frederick W.), Pierce, FL (USA)). 1976. Contract FG44-81R410475. 13p. NTIS, PC A02/MF A01. Order Number DE84000325.

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The methane digestor is a concrete structure with a vat in the middle which holds approximately 55 gallons of slurry. Wrapped inside the concrete and around the vat is copper tubing which is used in solar heating the slurry. In the bottom of the vat is a drain which will be used to discharge spent slurry. Attached to the digestor is a solar flat plate collector. It will be used to keep the slurry at an optimum temperature so as to allow the best environment for the bacteria to live in. The covering over the vat is a plastic drum. As gas is produced the drum will rise allowing a self-pressurized system. Then the gas is drained off and used to produce energy.

57008 (DOE/RA—50297) **Feasibility study of utilization of degummed soybean oil as a substitute for diesel fuel. Biomass alternative fuels program. Final report.** (Gold Kist, Inc., Decatur, AL (USA). Decatur Soy Div.). Nov 1981. Contract AC07-76ID01570. 285p. NTIS MF A01. Order Number DE84001309.

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The purpose of this project was to determine the economic and technological feasibility of producing a diesel oil substitute or extender from soybean oil. Existing technology was reviewed, to determine the minimum modification necessary for production of an acceptable fuel product. The information developed indicated that the degummed soybean oil produced by existing processing plants is theoretically suitable for use as a diesel fuel extender. This situation is very favorable to early commercialization of degummed soybean oil as a diesel fuel extender during the 1980's. Moreover, a large energy gain is realized when the soybean oil is utilized as fuel. Its heat of combustion is reported as 16,920 Btu per pound, or 130,000 Btu per gallon. Production of soybean oil consumes between 3000 and 5000 Btu per pound or 23,000 and 39,000 Btu per gallon. A resource availability study disclosed that the southeastern region of the United States produces approximately 260 million bushels of soybeans per year. In the same general area, fourteen extraction plants are operating, with a combined annual capacity of approximately 200 million bushels. Thus, regional production is sufficient to support the extraction capacity. Using an average figure of 1.5 gallons of oil per bushel of soybeans gives annual regional oil production of approximately 300 million gallons. An engine test plan was developed and implemented in this project. Data provide a preliminary indication that the blend containing one-third degummed soybean oil and two-thirds No. 2 diesel oil performed satisfactorily. Long term operation on the 50-50 blend is questionable. Detailed data and observations appear in the body of the report. The study also presents detailed engineering, financial, marketing, management and implementation plans for production of the proposed fuel blend, as well as a complete analysis of impacts. 4 references, 55 figures, 56 tables.

0902 Alcohol Fuels

REFER ALSO TO CITATION(S) 57043, 57287, 57290

57009 (CONF-810299—) **Northwest regional alcohol fuels conference: state of the art.** (Idaho State Office of Energy, Boise (USA)). Mar 1981. Contract AC02-79CS30159. 254p. NTIS MF A01. Order Number DE83016610.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

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The conference covered such topics as: safety guidelines and process controls for farm ethanol plants; business organization, permit requirements, and pollution control of ethanol plants; government assistance programs; technology assessments of alcohol production; the experiences of a large farm ethanol plant operation; utilization of by-products; starch conversion techniques; distillation of ethanol; alternative feedstocks; and alternative energy sources for alcohol production. Fourteen of the nineteen papers presented at the conference were abstracted separately. (CKK)

57010 (CONF-810299—, pp 23-36) **Safety guidelines for on-the-farm alcohol fuel plants.** Hanford, W.D. (National Safety Council, Chicago, IL). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

On-the-farm alcohol production of fuel to provide agriculture with its needed energy is still in the developmental stages. This report presents those safety guidelines that will aid the operator of an alcohol still in determining plant location and design, and operating procedures for mechanical and electrical equipment and storage and handling facilities. It also identifies those factors that can pose serious problems with respect to fire and life safety.

57011 (CONF-810299—, pp 37-44) **Form of business organization for productoin or marketing of fuel alcohol.** Kerr, R.M. (Tooze Kerr Marshall & Shenker, Portland, OR). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The purpose of this paper is to describe the characteristics and indicate advantages and disadvantages of the various types of legal entities that may be used in connection with commercial production, handling, and marketing of alcohol fuels. The types of business organizations discussed are: business corporation, Subchapter S corporation, nonprofit corporation, cooperative corporation, partnership including a limited partnership, and a joint venture. (CKK)

57012 (CONF-810299—, pp 65-72) **Overview of alcohol fuel production.** Taylor, R. (Univ. of Idaho, Moscow). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The basic steps in alcohol production are reviewed. These include feedstock preparation, cooking, saccharification, fermentation, and distillation. Dehydration, denaturing, and mash recovery are also included. (CKK)

57013 (CONF-810299—, pp 75-99) **Government funding for alcohol fuels production.** Chaney, R.E. (EG & G Idaho, Inc., Idaho Falls). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

There are several sources for alcohol fuel project funding through government agencies. Two major sources are the Department of Energy (DOE) and other federal government agencies (excluding the Department of Agriculture). Most of the programs offer one of four general types of assistance: grants, loans or grants for feasibility studies, cost sharing loans for construction - cooperative agreements, and loan guarantees. The Department of Energy has four major programs which supply funding for alcohol fuels projects: the Office of Alcohol Fuels; the Appropriate Technology Small Grants Program; the Urban Waste Program; and the Biomass Energy Systems Programs. At least four other government agencies have programs which provide support for alcohol projects. The Department of Commerce's Economic Development Administration provides grants and loan guarantees for projects which fall in EDA designated areas. The Small Business Administration provides loans and loan guarantees for small and medium sized projects. The Department of Housing and Urban Development program of Urban Development Action Grants provides discretionary grants, loans, and subsidies to projects whose sites fall within certain distressed areas. The Community Services Administration has grants available for research, development, and demonstration of energy sources. Descriptions of these programs, including funding limits, eligibility criteria, and agency contacts for application details, are given.

57014 (CONF-810299—, pp 101-114) **Pollution and alcohol fuel production.** Dameworth, W.O. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

A review is given of the air pollution control programs and agencies of the state and federal governments and their objectives in attainment and non-attainment areas. Specific emission standards for dusts, sulfur dioxide, odors, hazardous materials, and hydrocarbons encountered in the production of alcohol fuels are discussed. Pollution control devices effective with these pollution sources are described. Water pollution requirements are briefly discussed. The

environmental impact of an alcohol plant is minimal and, with proper design and operation, can easily meet state, federal, and local pollution control requirements. (CKK)

57015 (CONF-810299—, pp 115-125) **Janss alcohol plant.** Janss, L. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

A description is given of an ethanol plant located on a 3000 acre farm in Idaho. Corn, alfalfa, wheat, and potatoes are grown in rotation. Corn and potatoes are used as the feedstocks for ethanol production when the market price of these crops are low. The description of the plant and its operation include a discussion of the equipment problems that have been encountered. The stillage is dewatered on a vibrating screen, mixed with dewatered manure, silage, and low grade hay and fed to cattle in a feedlot. The resulting manure is dewatered and mixed with the next batch of feed to recapture more of the nutritional value. (CKK)

57016 (CONF-810299—, pp 127-133) **Janss Farms Inc. on-farm anhydrous ethanol plant: capital cost and cost to date.** Conlan, J. Jr. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

A 400,000 gallon per year anhydrous ethanol plant has been in operation since October, 1980 on the Janss Farm in Wendell, Idaho. The amount of capital investment required and the costs of operation are described. The plant cost $1.25 million to install, and with the current corn and wood fuel costs ($6.40/CWT and $12.50/ton respectively), one gallon of anhydrous ethanol costs $1.71 to produce when a stillage credit is taken. (The stillage is fed to cattle on the farm). The feedstock cost represents 64.5% of the cost of production. (CKK)

57017 (CONF-810299—, pp 137-161) **Controls for farmer's ethanol plants.** Bonne, U. (Honeywell Inc., Bloomington, MN). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The purpose of this report is to provide a basis from which one can decide how best to meet the challenge of providing controls for very small plants (5 to 100 gal/h) that would be operated by farmers or co-ops. The needed plant controls are as follows: a flexible, microprocessor-based, non-explosion proof, logic sequencer for mash preparation and disposal; low cost pH, glucose and ethanol sensors; an explosion proof package for the control of distillation and distillate handling in the flammables plant area. Explosion proof may include conventional electric controls with back-up by an ethanol sensor and sprinklers (ethanol is miscible with water and becomes non-flammable). Additional recommendations regarding control variables and setpoints were derived as a result of setting up a total ethanol plant energy simulation program and a plate-by-plate, iterative, distillation simulation which accommodates non-equilibrium vapor-liquid mass transfer, and conserves mass and energy. Energy balances or conservation are often neglected by conventional graphic McCabe-Thiele methods. 9 figures, 10 tables.

57018 (CONF-810299—, pp 163-182) **Byproducts generated by alcohol fuel production.** Waller, J.C.; Black, J.R.; Parsons, M.J.; Steinmetz, L.M. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

This paper presents a discussion of by-products produced when corn or potatoes are the feedstuffs used for alcohol production. The use of stillage for swine, poultry, and beef and dairy cattle feeds is discussed from a nutritional viewpoint. It is concluded that the most promising area for expansion of by-product use is in ruminants which can take advantage of the unique protein characteristics in the stillage. Data are presented on the nutrient composition of distillers dried grains from corn and potato fermentations, the daily gain in weight of steers fed varying diets supplemented with by-products, and the economic value of distillers dried grains and potato dried distillers residue in diets of beef cattle. 5 figures, 14 tables. (CKK)

57019 (CONF-810299—, pp 183-204) **Techniques for successful starch conversion and fermentation in the production of ethanol for fuel use.** Lines, K. (Energy Inc., Idaho Falls, ID). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The chemical structure and the process of hydrolysis of starch molecules are briefly described. Enzymatic hydrolysis is a two step process. During dextrinization small water soluble dextrins are produced. These are changed to glucose during saccharification using a second enzyme. The procedures and mechanisms of each step are discussed. Fermentation vessels, operating conditions, and yeast cell growth during fermentation are discussed in detail. A table summarizes the yields of ethanol that can be expected using wheat, barley, corn, or potatoes. 13 figures. (CKK)

57020 (CONF-810299—, pp 219-225) **New developments in alcohol fuels production.** Schmitt, R.C. (EG & G Idaho, Inc., Idaho Falls, ID). Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

Expansion of the alcohol fuels industry is dependent on federal policy and developments in technology. This paper summarizes the technological developments required for long term growth of the alcohol fuels industry. The utilization of new feedstocks to eliminate the controversy over food versus fuel includes the establishment and growth of fuel crops, e.g., fodder beets and sweet sorghum, and the conversion of presently underutilized cellulosic materials, such as agricultural wastes, forest residue, municipal wastes, and process stream wastes. Acid and enzymatic hydrolysis processes will need to be made economically competitive with other fuels. Energy efficient processes for alcohol production are needed to improve the energy balance, especially in small plants. Dehydration of alcohol for small plants is also discussed. It is recommended that a coordinating agency at the federal level provide the industry with a long-standing consistent policy. (CKK)

57021 (CONF-810299—, pp 227-230) **Possible heat sources for alcohol fuel production.** Sowards, N.K. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The efficiency and unit cost of energy required in the production of alcohol will be a major deciding factor in the economic feasibility of alcohol plants in the US. Alternative sources of energy for alcohol production are discussed. They can be summarized as follows: solar energy is not economically feasible; geothermal energy would work only in select locations; natural gas prices have risen to levels already economically unacceptable in some parts of the country; biomass is an attractive source; and coal is an attractive source. Livestock feedlot operations are usually planned as part of the alcohol plant to provide direct disposal of stillage. Six to ten pounds of stillage result in five to eight pounds of manure, which can be utilized in a combustion process to obtain from 50 to 100% of the steam energy demand. Coal combustion equipment for small and large plants is discussed. It is concluded that the optimum fuel choice and energy system should be based upon the size of the plant, its location, and fuel availability. (CKK)

57022 **(DOE/EA—0166) New England Ethanol, Inc. loan guarantee application, Androscoggin County, Maine. Environmental assessment.** (USDOE, Washington, DC). Sep 1983. 58p. NTIS, PC A04/MF A01. Order Number DE84001619.

The proposed plant will process 240 Gg (0.4×10^6 bu) of corn feedstock per year by dry milling to produce 95,000 m^3 (25×10^6 gal) of anhydrous ethanol. Corn is to be shipped from the midwest by unit train. The plant will be fueled with coal in a cogeneration facility which is expected to provide process steam and electricity. Other marketable by-products include 77 Gg (85,000 tons) per year of distillers dried grains and solubles and 67 Gg (74,000 tons) of water-washed carbon dioxide. Dehydration of the product alcohol will be by azeotropic distillation with cyclohexane, and denaturation will be with unleaded gasoline. The location of the proposed project is on a 43-ha (105-acre) tract within the city limits of Auburn. The impact of the proposed project to local or national agricultural capability is negligible. Soils of the project property

also have rapid permeability and exhibit a seasonally high water table. These characteristics imply that there is potential for contamination of groundwater and that dewatering may be required for construction of the proposed facility. Wastewater from the proposed project will be routinely discharged to the Lewiston-Auburn Water Pollution Control facility for treatment. No adverse impacts to quality of surface water or groundwater are therefore expected. Potential annual emissions of NO/sub x/ and SO_2 from combustion of coal are projected to be over 1.7 Gg and will require a Prevention of Significant Deterioration review. A best available control technology review will be required for NO/sub x/, SO_2, and total suspended particulates. Socioeconomic effects will be primarily positive by creating needed jobs and revenues. Negative impacts could occur from increased pressure of a tight housing market. There will be an increase in truck and auto traffic near the site.

57023 **(DOE/ER/10879—3) Fermentation to ethanol of xylose present in biomass byproduct solutions. Progress report, April 1, 1981-July 31, 1983.** (Washington Univ., Seattle (USA). Dept. of Genetics). 1983. Contract AT06-81ER10879. 18p. NTIS, PC A02/MF A01. Order Number DE84001104.

During the period of support by this grant, we have isolated and sequenced the gene for E. coli xylose isomerase and have achieved expression of the gene in the yeast Schizosaccharomyces pombe. We have also observed that, paradoxically, the xylose isomerase gene is transcribed in Saccharomyces cerevisiae but the corresponding protein cannot be found. Although the S. pombe transformant strain does not ferment xylose, it provides a basis for further experiments directed toward xylose fermentation by yeasts.

57024 **(DOE/ET/23089—T3) Biomass Based Methanol Process Development Program, 1978-1982. Appendices A, B, C, and D. Final report.** (Science Applications, Inc., McLean, VA (USA)). 1982. Contract AC01-78ET23089. 245p. NTIS MF A01. Order Number DE83018240.

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This volume contains 4 appendices entitled: evaluation of the operability of the Wright-Malta catalyzed steam gasification process; detailed material balance and energy and steam balance summaries for bad case designs; detailed estimation of annual operating and maintenance costs; and sample discount cash flow calculation results. 8 figures, 56 tables.

57025 **(DOE/R4/10134—T1) Extraction in alcoholic fermentation. Final report, January 1, 1980-March 31, 1982.** Toledo, R.T. (Georgia Univ., Athens (USA)). 1982. Contract FG44-80R410134. 28p. NTIS, PC A03/MF A01. Order Number DE84000813.

Production of fuel alcohol in a small scale is hampered by difficulty in obtaining good conversion of substrate to ethanol and variability of ethanol concentration in the product. Production of absolute ethanol suitable for blending with gasoline is not presently possible in a small scale using techniques used commercially. This research addressed the problem of improving alcohol productivity during fermentation and explored the feasibility of employing a solvent extraction procedure by fermentation. Yeast productivity averaged 158 and 26 grams ethanol per viable cell per hour, at 2.5 to 5% and 6 to 10% alcohol, respectively, in the medium. Cell recycling and retention of yeast cells in the fermentor sustained high alcohol productivity. Direct dodecane extraction of ethanol from dilute solutions was not feasible. However, at elevated temperatures (70°C) and alcohol concentrations in excess of 50%, equilibrium alcohol concentration in an anhydrous dodecane phase reached 2.5%. Absolute ethanol was obtained by heating the dodecane phase to 110°C and condensing the vapors. Activated carbon selectively absorbed ethanol from dilute alcoholic solutions. When the activated carbon bed was regenerated by heating at 80°C, vapors that left the bed and condensed had 65% ethanol. A simple process for producing absolute ethanol by fermentation was developed by combining carbon adsorption to concentrate the ethanol and dodecane extraction to produce the absolute ethanol. 7 references, 5 figures, 5 tables.

57026 **(DOE/R4/10216—T1) Azeotropic distillation of ethanol. Final report.** Zurn, E.F. (Zurn (Elmer F.), Camden, SC (USA)). [nd]. Contract FG44-80R410216. 10p. NTIS, PC A02/MF A01. Order Number DE84000705.

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The standard commercially used ternary agent for the upgrading of 190 proof ethanol to anhydrous ethanol is benzene. The primary disadvantages of a benzene ternary system are due to the narrow difference in boiling point betweeen the benzene-water-ethanol ternary and pure ethanol. The purposes of this project were to obtain some measure of the difference in energy requirement between use of dichloromethane and benzene as ternary distillation agents and to determine whether dichloromethane losses to the environment could be eliminated by use of a vent scrubbing system. A laboratory size distillation system was operated to concentrate an ethanol-water solution to the ethanol-water azeotrope (95%) and then to remove the remaining water by using dichloromethane and benzene as ternary distillation agents. A vent scrubbing system was used to prevent losses of organic materials from the distillation system. The results of the project indicate that energy requirements of a dichloromethane ternary distillation column are approximately 30% of the energy required in a benzene ternary column. The vent scrubbing system completely eliminated loss of dischloromethane to the environment even when cooling water temperatures were adjusted to approximate midsummer temperature conditions.

57027 **(DOE/R4/10231—T1) Small-scale ethanol-production demonstration.** Adcock, L.E. II; Eley, M.H.; Schroer, B.J. (Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center). Sep 1981. Contract FG44-80R410231. 137p. NTIS, PC A07/MF A01. Order Number DE84000709.

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The Johnson Environmental and Energy Center with assistance from the Madison County Farm Bureau Association received a grant from the US Department of Energy to design, fabricate, and evaluate a small scale continuous ethanol plant. The scope of the study was to satisfy four specific objectives. The first objective was to design a small scale continuous distillation unit capable of producing 10 to 15 gallons per hour of 170 to 190 proof ethanol. A second objective was to economically fabricate the distillation unit. A third objective was to thoroughly evaluate the unit with emphasis on production potential, operation considerations, and energy balance. The fourth objective was to work with the Farm Bureau in identifying an organization that would place the unit in a production environment. The results of the study indicate that the distillation unit is capable of producing an average of 9 to 14 gallons per hour (based on alcohol percent in beer) of 174 proof ethanol. The energy ratio for distillation is a positive 3:1. Once the unit has reached steady state very little operator attention is required with the exception of periodically refluxing. Material cost of the plate column is approximately $5000. The unit could be built by an individual provided he is trained in welding and has the necessary shop equipment. The report also contains 7 appendices entitled: Principles of ethanol production; pump manufacturer specifications; boiler manufacturer specifications, water treatment manufacturer specifications; tank specifications; test results; and boiler efficiency data sheets. 39 figures, 112 tables.

57028 **(DOE/R4/10231—T2) Small scale ethanol production: design manual.** Adcock, L.E. II; Eley, M.H.; Schroer, B.J. (Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center). Sep 1981. Contract FG44-80R410231. 56p. NTIS, PC A04/MF A01. Order Number DE84000402.

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The purpose of the project was to design, fabricate, and evaluate a small scale continuous ethanol plant. The scope of the study was to satisfy four specific objectives. The first objective was to design a small scale continuous distillation unit capable of producing 10 to 15 gallons per hour of 170 to 190 proof ethanol. A second objective was to economically fabricate the distillation unit. A third objective was to thoroughly evaluate the unit with emphasis on production potential, operation considerations, and energy balance. The fourth objective was to work with the Farm Bureau in identifying an organization that would place the unit in a pro-

duction environment. The results of the study indicate that the distillation unit is capable of producing and average of 9 to 14 gallons per hour (based on alcohol percent in beer) of 174 proof ethanol. The energy ratio for distillation is a positive 3:1. Once the unit has reached steady state very little operator attention is required with the exception of periodically refluxing. Material cost of the plate column is approximately $5000. The unit could be built by an individual provided he is trained in welding and has the necessary shop equipment. 39 figures, 12 tables.

57029 **(DOE/R4/10237—T1) Small-scale alcohol fuel plant. Final report.** Fitzcharles, H.M. III. (Fitzcharles (Howard M. III), Smyrna, TN (USA)). [nd]. Contract FG44-80R410237. 12p. NTIS, PC A02/MF A01. Order Number DE84000398.

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The objective to decrease the cost of distillation by the use of solar heat and a vacuum system combined was achieved. My original design of a single pot type still was altered during construction by dividing the distillation tank into three sections with a condenser coil after each section so that 160+ proof alcohol can be acquired without extensive reflux. However, some reflux will still be necessary to extract the most alcohol possible from the mash. This proto-type still could be reproduced for use as an On the Farm Plant if the components are size matched and the modifications are incorporated as I have outlined in Conclusions and Recommendations on page No. 4 of this report.

57030 **(DOE/R4/10267—T1) Selection of a yeast strain for sweet sorghum fermentation.** Bowling, M.C. (Albany Junior Coll., GA (USA)). [nd]. Contract FG44-80R410267. 14p. NTIS, PC A02/MF A01. Order Number DE84000783.

Seven natural and eight commercial yeast strains were tested for fermenting the high sugar content of sweet sorghum juice with a high yield of alcohol and a high pecentage utilization of the sugar within a ten day period. The sorghum juice pH was adjusted to range between 4 and 5. A comparison was made with and without an added nitrogen source. Fermentation temperatures were maintained at 27°C. The American Type Culture Collection # 918, a Saccharomyces species fermented the sorghum juice at the 26 and 18 to 20 balling (brix). No yeast strain was found to ferment the 30 balling juice within a ten day period at 90% utilization.

57031 **(DOE/R4/10409—T1) Small scale ethanol production demonstration: comparison of packed versus plate rectifying column.** Adcock, L.E. II; Eley, M.H.; Schroer, B.J. (Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center). Jul 1982. Contract FG44-81R410409. 73p. NTIS, PC A04/MF A01. Order Number DE84000438.

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The Johnson Environmental and Energy Center with assistance from the Madison County Farm Bureau Association received a grant in 1980 from the US Department of Energy to design, fabricate, and evaluate a small scale continuous ethanol plant. In 1981, the Center received a second DOE grant to compare the economics of replacing the plate rectifying column in the initial unit with a packed rectifying column. The results of the study indicate that the distillation unit with the packed rectifying column is capable of producing 14 gallons per hour of 170 proof ethanol. The energy ratio for distillation was a positive 2:1. Cost of the packed column was considerably less than the plate column. 1 reference, 19 figures, 9 tables.

57032 **(DOE/R4/10447—T1) Solar vacuum alcohol still. Final report.** (Southeastern Expeditions, Inc., Clayton, GA (USA)). 4 Feb 1983. Contract FG44-81R410447. 22p. NTIS, PC A02/MF A01. Order Number DE84000794.

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This project constructed a six-inch diameter solar vacuum alcohol still. The column was constructed with steel pipe and commercial packing was used to increase condensation surface area. A used automobile air compressor and a small electric motor were used to fabricate a vacuum pump capable of 25 inches of mercury. Flat plate commercial type solar collectors were used to heat the wine before it entered the distillation column. This resulted in a considerable reduction in fuel required. Additional heat was still needed from a propane fueled reboiler which utilized a closed loop copper coil to circulate water into the base of the column. Future research should focus on using solar panels to provide this heat source and reduce energy needs even further. The unit is capable of producing 135 proof alcohol in one pass. This unit or one of similar design could be utilized by a farm operation for supplemental fuels needs. 12 references, 7 figures.

57033 **(UCRL—53436) Economic impact of an improved methanol catalyst.** Grens, J.; Borg, I.; Stephens, D.; Colmenares, C. (Lawrence Livermore National Lab., CA (USA)). 23 Jun 1983. Contract W-7405-ENG-48. 8p. NTIS, PC A02/MF A01. Order Number DE84000736.

The economic future of methanol is reviewed in light of its potential uses as a substitute for traditional hydrocarbon fuels and feedstocks as well as some evolving new uses. Methanol's future market position will depend strongly on its production cost in comparison with competitive products. One promising way to reduce the production cost is by use of an improved catalyst in the process by which methanol is obtained from the feedstock - which can be either natural gas or a similar product such as synthesis gas from coal gasification. To estimate the potential cost savings with an improved catalyst, we have based our analysis on a recent study which assumed use of synthesis gas from underground coal gasification as a feedstock for making methanol. The improved catalyst we studied was an actinide oxide whose features include high tolerance to sulfur and heat, and a yield of about 4 mol% methanol per pass with a 2/1 mixture of H_2/CO. We calculated the effect of this catalyst on methanol production costs in a 12,000-bbl/day plant. The result was a saving of from 1 cent to 2.5 cent per gallon on the total methanol synthesis cost of 23 cents per gallon (i.e., a saving in the conversion process of 4.4% to 10.9%), excluding the cost of the raw feed gas. We conclude from this study that the improved catalyst could bring important savings in methanol production. The estimated savings range from 4.4% to 10.9% in the cost of methanol synthesis from the feedstock material. Another possibility for lowering methanol production costs in the future may lie in switching from a natural-gas-based feedstock to a coal-based feedstock - for example, using synthesis gas from underground coal gasification as the raw material. Our projections suggest that coal will eventually become a less expensive feedstock than natural gas.

0904 Solid Waste And Wood Fuels

REFER ALSO TO CITATION(S) 57021

57034 **(DOE/R4/10125—T1) Drying grain using crop residence as a fuel source. Final technical report.** Hammond, C. (Georgia Univ., Athens (USA)). Aug 1982. Contract FG44-80R410125. 14p. NTIS, PC A02/MF A01. Order Number DE84000811.

An indirectly-fired biomass fueled furnace was evaluated to determine the feasibility of drying grain using crop residues as a fuel source. The furnace efficiency and total heat delivery were determined. Funds for this project were provided by the Department of Energy through an appropriate technology grant. Stalks and residue were harvested in large round bales using conventional hay-handling equipment available on most farms. Calorimeter tests were made to determine the heat content available in various residues prior to combustion in the Stormor Bio Mass Heat System. This allowed total efficiency measurements by comparing total heat available and total heat delivered to the grain dryer. For example, a bale of cotton stalks returned over 60 percent of the useable heat for an efficiency of 63.7 percent. Other residues such as corn stalks gave slightly lower efficiency but clearly showed that adequate heat could be obtained to dry grain using heated air and no petroleum fuels. The air from the furnace went through an air-to-air heat exchanger to prevent contamination of the grain from smoke and combustion by-products. Although reducing efficiency somewhat, the heat exchanger allows grain or other materials such as peanuts to be dried for human consumption. Some evidence of overheating of the firebox doors was observed which led to some warping of the doors. This warping subsequently made temperature control more difficult, since the air supply and burn rate are directly relat-

ed. Air temperatures of up to 160°F were measured. The results show that biomass combustion as a fuel source to dry grain is possible with fuel savings of about ten cents per bushel at current fuel prices. Thus, the cost of the biomass burner could be recovered in drying some 70,000 bushels of grain. 5 figures, 5 tables.

57035 **(PB—83-262568) Fire-safety appraisal of residential wood and coal stoves in New York State. Final report.** Lassoie, J.P.; Provencher, R.W.; Goff, G.R.; Brown, T.L. (Cornell Univ., Ithaca, NY (USA). Dept. of Natural Resources). Apr 1983. 178p. (NYSERDA—83-3). NTIS, PC A09/MF A01.

This study was designed to identify solid fuel (wood and coal) residential heating safety problems and associated causes, and the barriers to correction of these problems in New York State. Data on solid fuel use was obtained via randomly conducted phone surveys, in-home resident interviews and solid fuel burning system inspections, and a mail survey of fire department chiefs. The study found that solid fuel (primarily wood) was a major heat source in 707,000, or 18% of the State's households (excluding Metropolitan New York City and southern Westchester County). Based on a safety evaluation system of 15 quantifiable installation, maintenance, and operation criteria developed during this study, the State's solid fuel heating systems were classified as being either safe (5.5%), unsafe (24.7%), hazardous (57.7%), or extremely hazardous (12.1%). The most important barriers to safety were those of homeowner complacency and apathy, with the former being the primary attitudinal barrier. Availability and affordability of safety information, and professional installation and inspection services generally were adequate; however, none of these had a substantial effect on the overall safety of the State's solid fuel systems. Results of the fire chief survey reflected a consensus of opinion on several key solid fuel safety issues. Fire chiefs believed that mandatory compliance by solid fuel users may be necessary for substantial improvement of the solid fuel safety situation due to the prevalence of certain attitudinal barriers. Recommendations designed to correct this situation through new, aggressive information and education programs and/or mandatory rules and regulations are presented and discussed. In addition, recommendations are presented for monitoring solid fuel safety, for cost assistance for homeowners to encourage the use of competent professionals, and for future research efforts. 25 references, 4 figures, 97 tables.

57036 **(PB—83-262576) Fire safety appraisal of residential wood and coal stoves in New York State. Appendices.** Lassoie, J.P.; Provencher, R.W.; Goff, G.R.; Brown, T.L. (Cornell Univ., Ithaca, NY (USA). Dept. of Natural Resources). Apr 1983. 124p. (NYSERDA—83-3-App.). NTIS, PC A06/MF A01.

This study was designed to identify solid fuel (wood and coal) residential heating safety problems and associated causes, and the barriers to correction of these problems in New York State. Based on the research findings, recommendations were developed regarding public and private policies and services, legislation, and financial systems designed to improve the State's solid fuel heating safety situation. Data on solid fuel use was obtained via randomly conducted phone surveys, in-home resident interviews and solid fuel burning system inspections, and a mail survey of fire department chiefs. This volume contains appendices A-J entitled: Summary of Model Building Codes; Survey Vehicles; Distribution of Counties by Survey Region; Crossley Survey Statistics; Sampling Strategy of Fire Chief Survey; Statewide Data Weighting Process; Safety Grade Criteria for 15 Safety Factors; Demographics of Residents Using at Least Some Solid Fuel; Relationship between Relative Frequencies of Specific Safety Factors and Type of Solid Fuel Heating Unit; and Likelihood of Households currently not heating with solid fuel doing so within the next year. 30 tables.

13 HYDRO ENERGY

REFER ALSO TO CITATION(S) 56996, 56997, 56998

1306 Environmental Aspects

57037 **(CONF-830939—3) Field test of a biological assumption of instream flow models.** Cada, G.F.; Sale, M.J.; Cushman, R.M.; Loar, J.M. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE84000204.

From Waterpower '83 - international conference on hydropower; Knoxville, TN, USA (18 Sep 1983).

Hydraulic-rating methods are an attractive means of deriving instream flow recommendations at many small hydropower sites because they represent a compromise between relatively inexpensive, low-resolution, discharge methods and the costly, complex, habitat evaluation models. Like the other methods, however, they rely on certain biological assumptions about the relationship between aquatic biota and streamflow characteristics. One such assumption is that benthic production available as food for fishes is proportional to stream bottom area. Wetted perimeter is an easily measured physical parameter which represents bottom area and that is a function of discharge. Therefore, wetted perimeter should reflect the benthic food resource available to support stream fishes under varying flows. As part of a larger effort to compare a number of existing instream flow assessment methods in southern Appalachian trout streams, we examined the validity of the benthos/wetted perimeter relationship at four field sites. Benthos samples were taken at permanent riffle transects over a variety of discharges and were used to relate observed benthos densities to the fluctuations in wetted perimeter and streamflow in these systems. For most of the sites and taxa examined, benthic densities did not show a consistent relationship with discharge/wetted perimeter dynamics. Our analysis indicates that simple physical habitat descriptors obtained from hydraulic-rating models do not provide sufficient information on the response of benthic organisms to decreased discharges. Consequently, these methods may not be sufficient to protect aquatic resources in water-use conflicts.

57038 **(CONF-830939—4) Biotic effects of rapidly varying flow from hydropower facilities.** Cushman, R.M. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 11p. NTIS, PC A02/MF A01. Order Number DE84000687.

From Waterpower '83 - international conference on hydropower; Knoxville, TN, USA (18 Sep 1983).

Rapid changes in flow below hydroelectric facilities result from peaking operations, where water is typically stored in the reservoir at night and released through turbines to satisfy increased electrical demand during the day. The potential impacts of these short-term recurring disturbances of aquatic systems below dams are important considerations in hydropower development. Reduced biotic abundance, diversity, and productivity in tailwaters may be due to flow variations or a variety of related factors, such as changes in water depth or temperature, or scouring of sediment deposits. Information needs for site-specific evaluations of potential impacts at hydroelectric peaking projects are outlined, along with management and mitigation options to reduce anticipated adverse effects.

1307 Power Conversion Systems

57039 **(DOE/R4/10243—T1) Design and evaluation of small water turbines. Final report.** Marquis, J.A. (Tennessee Technological Univ., Cookeville (USA). Dept. of Mechanical Engineering). 17 Feb 1983. Contract FG44-80R410243. 53p. NTIS, PC A04/MF A01. Order Number DE84000404.

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An evaluation was made of the design and hydromechanical performance characteristics for three basic turbine types: axial flow (Jonval), inward radial flow (Francis) and crossflow (Banki). A single commercially available turbine representative of each type and within the appropriate power range (<5hp) was obtained for

evaluation. Specific turbine selections were based on price, availability and suitability for operation at heads of 50 feet or less and flows under 2 cubic feet per second. In general, the peak operating efficiencies of each unit tended to be lower than anticipated, falling in the range of 40 to 50%. With sufficient flow, however, significant useful power outputs up to 3 hp were obtained. While the radial flow turbine (a centrifugal pump operated as a turbine) had the lowest initial unit cost, the axial and cross flow designs exhibited more stable operation, particularly under transient loadings. The crossflow turbine had the added advantage that it was essentially self-cleaning. With further developmental effort and appropriate design modifications it should be possible to bring each of these microhydro designs to their full performance potential.

57040 **(DOE/R4/10415—T1) Designs and applications for floating-hydro power systems in small streams.** Rehder, J.B. (Rehder (John B.), Knoxville, TN (USA)). 1 Jan 1983. Contract FG44-81R410415. 45p. NTIS, PC A03/MF A01. Order Number DE84000395.

The project focuses on an appropriate technology for small-scale hydro power: floating waterwheels and turbines. For background, relic and existing systems such as early floating mills, traditional Amish waterwheels, and micro-hydro systems are examined. In the design phase of the project, new designs for Floating Hydro Power Systems include: an analysis of floatation materials and systems; a floating undershot waterwheel design; a floating cylinder (fiberglass storage tank) design; a submerged tube design; and a design for a floating platform with submerged propellers. Finally, in the applications phase, stream flow data from East Tennessee streams are used in a discussion of the potential applications of floating hydro power systems in small streams.

14 SOLAR ENERGY

REFER ALSO TO CITATION(S) 56996, 56997, 56998

1403 Economics

REFER ALSO TO CITATION(S) 57062, 57063

57041 **(DOE/JPL—1012-79A) Polycrystalline silicon material availability and market pricing outlook study for 1980-1988: January 1983 update.** Costogue, E. (Jet Propulsion Lab., Pasadena, CA (USA)). Feb 1983. Contract AI01-76ET20356. 44p. (JPL-PUBL—83-9). NTIS, PC A03/MF A01. Order Number DE84001226.

Photovoltaic solar cell arrays which convert solar energy into electrical energy can become a cost-effective, alternative energy source provided that an adequate supply of low-priced materials and automated fabrication techniques are available. Presently, silicon is the most promising cell material for achieving the near-term cost goals of the Photovoltaics Program. Electronic grade silicon is produced primarily for the semiconductor industry with the photovoltaic industry using, in most cases, the production rejects of slightly lower-grade material. Therefore, the future availability of adequate supplies of low cost silicon has been one of the major concerns of the Photovoltaics Program. This current report updates the supply outlook for silicon with emphasis on pricing, and is based primarily on an industry survey conducted by a JPL consultant. This survey included interviews with polycrystalline silicon manufacturers, a large cross-section of silicon users and silicon solar cell manufacturers.

1404 Environmental, Legal, And Institutional Aspects

57042 **(DOE/R4/10081—T1) Solar trailer. Final progress report.** (Florence-Darlington Technical Coll., Florence, SC (USA)). 1982. Contract FG44-80R410081. 7p. NTIS, PC A02/MF A01. Order Number DE84000704.

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The solar trailer contains passive as well as active systems. The passive being the design and the active systems consisting of photovoltaics operating lights and fans as well as charging batteries, two sets of hot water collectors - one heating an 80 gallon hot water system and the other heating water which in turn heats a rock bed for room heat. We have electrically operated schematic diagrams showing the systems used in the trailer, also, an operating hot water scale model which includes piping, pumps, and electrical systems. The two hot water systems are monitored with digital readout systems showing temperatures at various locations. This trailer will continue to be moved to various locations of the Florence and Darlington areas so that the public can observe what can be done with the sun's energy.

1405 Solar Energy Conversion

REFER ALSO TO CITATION(S) 56850, 56999, 57002, 57005, 57006, 57007, 57008, 57009, 57012, 57015, 57016, 57018, 57019, 57020, 57022, 57023, 57024, 57025, 57027, 57028, 57030, 57034, 57041, 57092

57043 (CONF-810299—, pp 213-215) **Jerusalem artichoke: a special crop for alcohol.** Lukens, T. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

The desirable characteristics for alcohol production that the Jerusalem artichoke displays are described. It can be grown inexpensively, stored and obtained in sufficient quantities year round, fermented easily and completely, and it produces 2 to 5 times more alcohol per acre than corn. Alcohol production from the tubers is the usual process because of their storage flexibility; however, fermentation of the tops is also discussed. The expected yield of alcohol is 500 to 560 gallons per acre when fermenting the tubers and a minimum of 455 gallons per acre when fermenting the tops. When a plantation is managed for the tops, the tubers will need harvesting and replanting only once every four years. Another potential market is found in syrup sweeteners used in the food and beverage industries. (CKK)

57044 **(DOE/R4/10435—T1) Collapsible photovoltaic-concentrator array portable power from the sun. Final project report.** Bates, A. (Farm, Summertown, TN (USA)). 1 Mar 1983. Contract FG44-81R410435. 18p. NTIS, PC A02/MF A01. Order Number DE84000713.

A lightweight, inexpensive public address system was designed, constructed, and then demonstrated at the 1982 World's Fair. The system was powered by a portable, modular, concentrating photovoltaic array. After completion of the demonstration, experiments were conducted to examine alternative designs. All designs achieved the project goals of portability, weatherability, reduced expense, and adequate power margin. The prototypes are now used regularly at public gatherings in the Southeast.

57045 **(EUR—8217-EN) Fabrication of silicon prototype panels with one dimensional concentration.** van Overstraeten, R.; Mertens, R. (Commission of the European Communities, Luxembourg). 1982. 83p. Commission of the European Communities, Luxembourg.

The main objective of this project is a better understanding of the limitations that influence the efficiency of silicon junction solar cells. In particular, attention has been focused onto the mechanisms that determine the open circuit voltage.

57046 **(N—8321510) Results of the 1982 NASA/JPL balloon flight solar cell calibration program.** Downing, R.G.; Weiss, R.S. (Jet Propulsion Lab., Pasadena, CA (USA)). Mar 1983. 16p. (NASA-CR—170123). NTIS, PC A02/MF A01.

The 1982 solar cell calibration balloon flight was successfully completed on July 21, meeting all objectives of the program. Twenty-eight modules were carried to an altitude of 36.0 kilometers. The calibrated cells can now be used as reference standards in simulator testing of cells and arrays.

57047 **(N—8321512) Large area, low cost solar cell development and production readiness. Final Report.** Michaels, D. (Spectrolab, Inc., Sylmar, CA (USA)). Jan 1982. 60p. (NASA-CR—170037). NTIS, PC A04/MF A01.

A process sequence for a large area (greater than or equal to 25 sq. cm) silicon solar cell was investigated. Generic cell choice was guided by the expected electron fluence, by the packing factors of various cell envelope designs onto each panel to provide needed voltage as well as current, by the weight constraints on the system, and by the cost goals of the contract.

57048 **(N—8322741) Lightweight solar array blanket tooling, laser welding and cover process technology. Final Report.** Dillard, P.A. (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA (USA); Jet Propulsion Lab., Pasadena, CA (USA)). Jan 1983. 51p. (NASA-CR—170209). NTIS, PC A04/MF A01.

A two phase technology investigation was performed to demonstrate effective methods for integrating 50 micrometer thin solar cells into ultralightweight module designs. During the first phase, innovative tooling was developed which allows lightweight blankets to be fabricated in a manufacturing environment with acceptable yields. During the second phase, the tooling was improved and the feasibility of laser processing of lightweight arrays was confirmed. The development of the cell/interconnect registration tool and interconnect bonding by laser welding is described.

57049 **(N—8322742) Development of technologies for welding interconnects to fifty-micron thick silicon solar cells.** Patterson, R.E. (TRW Defense and Space Systems Group, Redondo Beach, CA (USA); Jet Propulsion Lab., Pasadena, CA (USA)). Dec 1982. 67p. (NASA-CR—170212; JPL—9950-806). NTIS, PC A04/MF A01.

A program was conducted to develop technologies for welding interconnects to 50 microns thick, 2 by 2 cm solar cells. The cells were characterized with respect to electrical performance, cell thickness, silver contact thickness, contact waviness, bowing, and fracture strength. Weld schedules were independently developed for each of the three cell types and were coincidentally identical. Thermal shock tests (100 cycles from 100 C to -180 C) were performed on 16 cell coupons for each cell type without any weld joint failures or electrical degradation. Three 48 cell modules (one for each cell type) were assembled with 50 microns thick cells, frosted fused silica covers, silver clad Invar interconnectors, and Kapton substrates.

57050 **(N—8322745) Stress studies in EFG.** (Mobil Tyco Solar Energy Corp., Waltham, MA (USA); Jet Propulsion Lab., Pasadena, CA (USA)). Feb 1983. 22p. (NASA-CR—170205; JPL—9950-810). NTIS, PC A02/MF A01.

A computer code which can account for plastic deformation effects on stress generated in silicon sheet grown at high speeds is fully operative. Stress and strain rate distributions are presented for two different sheet temperature profiles. The calculations show that residual stress levels are very sensitive to details of the cooling profile in a sheet with creep. Experimental work has been started in several areas to improve understanding of ribbon temperature profiles and stress distributions associated with a 10 cm wide ribbon cartridge system.

57051 **(N—8324465) Journal of Nanjing Institute of Technology (selected articles).** Huang, Q.; Zhang, M.; Deng, H.; Zhao, S.; Yeng, Z.; Zhang, J.; Zhao, Z. (Air Force Systems Command, Wright-Patterson AFB, OH (USA)). Dec 1982. 27p. (AD-A—124002; FTD-ID(RS)T—0958-82). NTIS, PC A03/MF A01.

Translated from Nanjing Daxue Xuebao (China), No. 1, 102-112, 1982.

The use of ellipsometry to measure the thickness of less than 50A ultrathin oxide films on silicon solar cells is described as well as the design of a copper chloride laser with an average power greater than 500 milliwatts and a lifetime exceeding 100 hours.

57052 **(SERI/STR—214-1997) Design analysis of advanced photovoltaic technologies.** Lambarski, T.J.; Irby, C.A.; Collaros, G.J.; Anderson, E.R.; Sowa, P.; Schwinkendorf, W.E.; Resnik, W.M. (BDM Corp., Albuquerque, NM (USA)). Aug 1983. Contract AC02-77CH00178. 580p. NTIS, PC A25/MF A01. Order Number DE84000008.

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This document combines two interrelated reports that address design and optimization methodologies for advanced photovoltaic cells and devices as related to module and system application designs. Four advanced photovoltaic material cells - polycrystalline silicon, amorphous silicon, $CdS/CuInSe_2$, and gallium arsenide - were evaluated for conceptual modeling and analysis in regard to residential and central station system design applications. A module optimization methodology is described along with the computer code PVMOC (Photovoltaic Module Optimization Code), to assist PV module designers using advanced PV material cells in evaluating the performance and cost of alternative designs. As advances in cell research evolve, the parameters used here are likely to change; therefore, current assumptions should be obtained before employing the design techniques provided in this document.

57053 **(SERI/STR—231-1896) Yields, photosynthetic efficiencies, and proximate chemical composition of dense cultures of marine microalgae. A subcontract report.** Thomas, W.H.; Seibert, D.L.R.; Alden, M.; Eldridge, P.; Neori, A. (Scripps Institution of Oceanography, San Diego, CA (USA)). Jul 1983. Contract AC02-77CH00178. 63p. NTIS, PC A04/MF A01. Order Number DE83011992.

The yields, photosynthetic efficiencies, and proximate composition of several microalgae were compared in dense cultures grown at light intensities up to 70% sunlight. Yields ranged from 3.4 to 21.7 g dry weight/m^2 day. The highest yield was obtained with Phaeodactylum; the lowest in Botryococcus cultures. The same species had the highest and lowest efficiencies of utilization of photosynthetically active radiation. In nitrogen-sufficient cells of all but one species, most of the dry weight consisted of protein. Lipid content of all species was 20 to 29%, and carbohydrate content 11 to 23%. Lipid content increased somewhat in N-deficient Phaeodactylum and Isochrysis cells, but decreased in deficient Monallanthus cells. Because the overall dry weight yield was reduced by deficiency, lipid yields did not increase. However, since the carbohydrate content increased to about 65% in N-deficient Dunaliella and Tetraselmis cells, the carbohydrate yield increased. In Phaeodactylum the optimum light intensity was about 40% of full sunlight. Most experimets with this alga included a $CUSO_4$ filter to decrease infrared irradiance. When this filter was removed, the yield increased because more red light in the photosynthetically active spectral range was included. These results should prove useful to workers attempting to maximize yields and efficiencies, but additional studies are needed. 69 references, 27 figures, 18 tables.

57054 **New promise for photovoltaics.** Whitaker, R.; DeMeo, E.; Taylor, R. *EPRI (Electric Power Research Institute) Journal;* 8: No. 6, 6-15(Jul-Aug 1983).

A year-long critical assessment of solar cell R and D at the Electric Power Research Institute has recently been reviewed. Significance is seen in the size and scope of industrial commitments, the identities of the participants, and the focus of R and D. Most importantly, consensus is found on three promising approaches to photovoltaics: multilayer thin films of amorphous silicon, single-crystal silicon ribbon, and specially designed cells for use in concentrated sunlight.

57055 **Energy farms: are they for real?.** *Agricultural Engineering;* 63: No. 11, 8-11(Nov 1982).

This is an interview with the retired manager of the Energy Integrated Farm System Program. Seven energy-integrated farms were developed by the US DOE with the cooperation of USDA, to help farmers in selecting systems specific to their size, type and location. Systems being investigated include: electrical power from methane generation, waste heat utilization, solar energy, and conservation tillage. At present fuel prices, grain alcohol is not considered economically feasible.

57056 **The effect of ambient redox potential on the transient electron spin echo signals observed in chloroplasts and photosynthetic algae.** Thurnauer, M.C. (Argonne National Lab., IL); Rutherford, A.W.; Norris, J.R. *Biochimica et Biophysica Acta;* 682: 332-338(1982). Contract W-31-109-ENG-38.

Time-resolved electron spin echo (ESE) studies were carried out at room temperature on chloroplast preparations and whole cells of photosynthetic algae. The signals observed exhibit the unexpected special ESE signal which we have proposed to be the result of transient interactions between P^+-700 and an early electron acceptor of Photosystem I. The intensity of the special ESE signal decreases with the chemical reduction of the Center A-Center B complex. The results suggest that in the untreated photosynthetic systems we are initially observing P^+-700 as it interacts with the reduced acceptor which precedes the Center A-Center B complex. Then the decay of the special ESE signal (approx. 170 ns) gives the lifetime of this reduced acceptor as it participates in forward electron transport.

1406 Photovoltaic Power Systems

REFER ALSO TO CITATION(S) 56850, 57042, 57044, 57095

57057 **(DOE/R4/10090—T1) Solar-air power plant. Interim report, January 1, 1980-November 1, 1981.** Chen, I. (Alabama A and M Univ., Huntsville (USA). Solar Energy Task Force). 1982. Contract FG44-80R410090. 68p. NTIS, PC A09/MF A01. Order Number DE84000764.

The chimney conversion efficiency of transferring solar energy into wind energy for the proposed solar-air power plant has been investigated. The application of a chimney as the air-cooling system for a large-scale photovoltaic concentration power plant to transfer solar energy into electricity has also been studied. Several conclusions in reference to this basic research project and suggestions for further research phases are also summarized in this report.

57058 **(DOE/R4/10318—T1) Solar-powered car. Final report.** Plank, D. (Plank (Don), St. Petersburg, FL (USA)). 30 Mar 1982. Contract FG44-80R410318. 7p. NTIS, PC A02/MF A01. Order Number DE84000414.

The work reported was to modify a commercially available electric vehicle to use power generated by solar cells. Besides the technical and financial aspects of constructing the car, media publicity and public showings of the car are discussed. (LEW)

57059 **(N—8321513) Technology of elevated voltage solar arrays: Key items test and evaluation. Part 2: Simulated LEO-plasma tests. Final Report.** Bebermeier, H.; Eggers, G.; Nuernberger, R.; Goelz, W.; Stasek, G. (Allgemeine Elektricitaets-Gesellschaft AEG Telefunken, Wedel (Germany, F.R.)). Mar 1982. 114p. (ESA-CR(P)—1646). NTIS, PC A06/MF A01.

The electrical layout of a 250 kW solar array was analyzed in TEVSA-KITE I and potential problem areas were identified. In the present report (TEVSA-KITE II) research and development activities are described which have been made necessary by the desire to understand the phenomena observed in the initial tests and to make a more complete assessment of the in-orbit effects of 200 - 1000 volt solar arrays. System and component requirements of the power-conditioning system were compared with current practice in order to identify areas requiring development effort. It was found that for voltages up to 200/300 V, components and systems are available but are not yet space qualified. The high-voltage tests of solar-array components were continued. A critical threshold of 500 - 600 V was identified for vacuum orbit conditions. Outgassing after launch may be a potential reason for failure. The plasma tests at Freiburg showed that there was a very narrow range in which ohmic discharge occurs. Outside this range, a dramatic increase in leakage current is expected. The critical voltage threshold was identified at ca. 250 V. The study shows that current solar-array technology is adequate for low Earth orbit environment up to a voltage of about 250 V. Plasma discharge will then be initiated. At voltages above 500/600 V, partial discharge through the substrate will reduce the lifetime of the solar array.

57060 **(N—8321514) Evaluation of various solar-cell-to-interconnector welds by means of scanning laser acoustic microscopy and metallography.** Dunn, B.D.; Burke, W.R. (European Space Agency, 75 - Paris (France)). Aug 1982. 44p. (ESA-STM—225). NTIS, PC A03/MF A01.

The quality of electrical resistance welds uniting spacecraft solar array components, such as solar cells, interconnectors, shunt diodes and bus bars cannot be assessed by visual inspection. A variety of welded samples, some joined in typical spacecraft configurations and following environmental testing, were examined by nondestructive testing and metallography. The size of the welds was determined and their position located by scanning laser acoustic microscopy. The high accuracy of acoustic micrographs is confirmed by mechanical tests and metallography. A procedure for microsectioning is recommended as it is essential to remove the smeared silver layer on polished microsections to reveal the true weld. Of the various interconnector materials it appears that the silver coated molybdenum type provides the most reliable weld.

57061 **(N—8322756) Study of solar array switching power management technology for space power system. Final Report.** Cassinelli, J.E. (TRW Space Technology Labs., Redondo Beach, CA (USA)). Sep 1982. 240p. (NASA-CR—167890). NTIS, PC A11/MF A01.

This report documents work performed on the Solar Array Switching Power Management Study. Mission characteristics for three missions were defined to the depth necessary to determine their power management requirements. Solar array switching concepts which could satisfy the mission requirements were identified. The switching concepts were compared with a conventional buck regulator system for cost, weight and volume, reliability, efficiency and thermal control. Solar array switching provided significant advantages in all areas of comparison for the reviewed missions.

1407 Solar Thermal Power Systems

REFER ALSO TO CITATION(S) 57057, 57095

57062 **(DOE/JPL—1060-60-Vol.1) Solar-thermal technology development: estimated market size and energy cost savings. Volume I. Executive summary.** Gates, W.R. (Jet Propulsion Lab., Pasadena, CA (USA)). Feb 1983. Contract AC04-76DP00789. 13p. NTIS, PC A02/MF A01. Order Number DE84001223.

Estimated future energy cost savings associated with the development of cost-competitive solar thermal technologies (STT) are discussed. Analysis is restricted to STT in electric applications for 16 high-insolation/high-energy-price states. Three fuel price scenarios and three 1990 STT system costs are considered, reflecting uncertainty over future fuel prices and STT cost projections. STT R and D is found to be unacceptably risky for private industry in the absence of federal support. Energy cost savings were projected to range from $0 to $10 billion (1990 values in 1981 dollars), depending on the system cost and fuel price scenario. Normal R and D investment risks are accentuated because the Organization of Petroleum Exporting Countries (OPEC) cartel can artifically manipulate oil prices and undercut growth of alternative energy sources. Federal participation in STT R and D to help capture the potential benefits of developing cost-competitive STT was found to be in the national interest. Analysis is also provided regarding two federal incentives currently in use: the Federal Business Energy Tax Credit and direct R and D funding. These mecahnisms can be expected to provide the required incentives to establish a viable self-sustaining private STT industry. Discussions of STT impacts on the environment and oil imports are also included.

57063 **(DOE/JPL—1060-60-Vol.2) Solar thermal technology development: estimated market size and energy cost savings. Volume II. Assumptions, methodology, and results.** Gates, W.R. (Jet Propulsion Lab., Pasadena, CA (USA)). Feb 1983. Contract AC04-76DP00789. 98p. NTIS, PC A05/MF A01. Order Number DE84001224.

Estimated future energy cost savings associated with the development of cost-competitive solar thermal technologies (STT) are discussed. Analysis is restricted to STT in electric applications for 16 high-insolation/high-energy-price states. Three fuel price scenarios and three 1990 SST systems costs are considered, reflecting uncertainty over future fuel prices and STT cost projections. Solar thermal technology research and development (R and D) is found to be unacceptably risky for private industry in the absence of fed-

eral support. Energy cost savings are projected to range from $0 to 10 billion (1990 values in 1981 dollars), depending on the system cost and fuel price scenario. Normal R and D investment risks are accentuated because the Organization of Petroleum Exporting Countries (OPEC) cartel can artifically manipulate oil prices and undercut growth of alternative energy sources. Federal participation in STT R and D to help capture the potential benefits of developing cost-competitive STT was found to be in the national interest. Analysis is also provided regarding two federal incentives currently in use: the Federal Business Energy Tax Credit and direct R and D funding. These mechanisms can be expected to provide the required incentives to establish a viable self-sustaining private STT industry. Discussions of STT impacts on the environment and on oil imports are also included.

57064 **(DOE/R4/10097—T1) Development and testing of a rotary solar engine. Final report.** Kanaly, D.B. (Kanaly (David B.), Melbourne, FL (USA)). [nd]. Contract FG44-80R410097. 21p. NTIS, PC A02/MF A01. Order Number DE84000744.

A rotary solar engine has been constructed and tested. By sealing Freon (having the environmentally safe composition rather than the conventionally used harmful composition) in its bellows instead of air, sufficiently consistent operation can be achieved to serve the purely mechanical rotary light-load or no-load markets. Although its power efficiency is not sufficient to make it competitive as a prime power generator, even for power outputs as low as a few ounce inches per minute, it simplicity and reliability make it an attractive self-powered source of mechanical control power for critical slow speed actuators. Its simplicity and low cost make it particularly attractive for the small (less than 10 in^3) display markets. Other markets may now be identified, now that its strength/limitations are known.

57065 **(DOE/R4/10254—T1) Roof-mounted solar-and-wind-powered turbine. Final report.** Goerz, J.W. (Goerz (Jerry W.), Lexington, KY (USA)). 22 Dec 1982. Contract FG44-80R410254. 12p. NTIS, PC A02/MF A01. Order Number DE84000768.

This project was an effort to convert solar energy into electricity by utilizing hot-air convection to turn a turbine. To be considered useful, such a mechanism must generate enough electricity at a cost low enough to be competitive with photovoltaics. The extraction of wind energy incidental to the solar experiment was anticipated. The mechanism constructed generates an amount of electricity so small with respect to its cost that it cannot be considered competitive with photovoltaics.

1408 Ocean Thermal Gradient And Salinity Gradient Power Systems

REFER ALSO TO CITATION(S) 56850

57066 **(DOE/ET/21001—T2) Preliminary design of an Osmotic-Type Salinity-Gradient Energy Converter: Phase II.** (Ebasco Services, Inc., New York (USA)). Sep 1983. Contract AC05-79ET21001. 140p. NTIS, PC A07/MF A01. Order Number DE83017556.

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This report presents the preliminary design of a 50 kW/sub e/ closed-cycle osmotic pressure power system using a saturated solar pond as the unmixer for the mixed brine with 7.7 percent potassium alum solution on one side and 52 percent potassium alum solution on the other side of the semipermeable membrane. The report includes system description with flow diagram, general arrangement, general pipe routing between equipment drawings and component performance specifications; siting restrictions; environmental considerations; pretreatment; membrane characteristics; preliminary system capital, operating and maintenance costs; and recommendations for further work. It was found that the area requirement for a saturated solar pond is less than one-tenth of that required for a solar evaporation pond as found during Phase I of the study. The pretreatment cost was found to be much less in this case because the system is closed. Finally, the use of a saturated solar pond greatly increases the potential number of sites available for a practical osmotic pressure power system.

57067 **(DOE/ET/21099—T1) OTEC Utility Users Council, 1981 activities.** (Puerto Rico Electric Power Authority, San Juan). Sep 1981. Contract FG01-80ET21099. 9p. NTIS, PC A02/MF A01. Order Number DE84001159.

A summary of the OTEC Council activities is presented as follows: (1) meetings; (2) new members; (3) OTEC 2000 AD market forecast; (4) 8th Ocean Energy Conference presentation; (5) OTEC pilot plant participation; (6) 1982 future plans; and (7) expenditures.

57068 **(DOE/ET/29180—T1) Riser-cable development for ocean thermal energy conversion plants.** (Simplex Wire and Cable Co., Portsmouth, NH (USA)). Jul 1983. Contract AC05-79ET29180. 401p. NTIS, PC A18/MF A01. Order Number DE84001138.

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A four-year program has been completed for the design, manufacture, and evaluation of high-voltage riser cables for use with moored, floating, ocean thermal energy conversion (OTEC) power plants. Two riser-cable designs have been manufactured and tested; one using self-contained, oil-filled (SCOF) insulation and the other using cross-linked polyethylene (XLPE) insulation. SCOF and XLPE cables manufactured for testing are evaluated for suitability in OTEC service. Shortcomings of existing designs are noted. A sensitivity analysis of cable design characteristics according to specified design and environmental conditions has also been conducted from which guidelines for second-generation cable designs are then developed. The report concludes with a discussion of the relative merits of each cable concept. The discussion identifies changes in cable and system design necessary for successful cable-system development and identifies future research and development needs.

1409 Solar Thermal Utilization

REFER ALSO TO CITATION(S) 56850, 57007, 57029, 57032, 57042, 57042, 57095, 57256, 57674

57069 **(DOE/CS/30574—T7) Solar energy system performance evaluation - final report for Honeywell OTS 45, Salt River Project, Phoenix, Arizona.** Mathur, A.K. (Honeywell, Inc., Roseville, MN (USA). Technology Strategy Center). Sep 1983. Contract AC03-81CS30574. 105p. NTIS, PC A06/MF A01. Order Number DE84000459.

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This report describes the operation and technical performance of the Solar Operational Test Site (OTS 45) at Salt River Project in Phoenix, Arizona, based on the analysis of data collected between April 1981 and March 31, 1982. The following topics are discussed: system description, performance assessment, operating energy, energy savings, system maintenance, and conclusions. The solar energy system at OTS 45 is a hydronic heating and cooling system consisting of 8208 square feet of liquid-cooled flat-plate collectors; a 2500-gallon thermal storage tank; two 25-ton capacity organic Rankine-cycle-engine-assisted water chillers; a forced-draft cooling tower; and associated piping, pumps, valves, controls and heat rejection equipment. The solar system has eight basic modes of operation and several combination modes. The system operation is controlled automatically by a Honeywell-designed microprocessor-based control system, which also provides diagnostics. Based on the instrumented test data monitored and collected during the 8 months of the Operational Test Period, the solar system collected 1143 MMBtu of thermal energy of the total incident solar energy of 3440 MMBtu and provided 241 MMBtu for cooling and 64 MMBtu for heating. The projected net annual electrical energy savings due to the solar system was approximately 40,000 kWh(e).

57070 **(DOE/CS/32126—T1) San Luis Cultural Center. Final report.** (San Luis Board of Trustees, CO (USA)). [nd]. Contract FC03-78CS32126. 64p. NTIS, PC A04. Order Number DE84000799.

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A solar energy system was retrofitted onto two buildings used by the San Luis School District. The renovations included many conservation measures, including insulation, double glass windows, and a more efficient heating system. The solar energy system, that provides space and water heating, has 2560 square feet of flat plate collectors and 3500 gallons of water for storage. System design, operation and maintenance, and acceptance testing are documented. (LEW)

57071 **(DOE/R4/10080—T1) Solar project.** (North Greenville Coll., Tigerville, SC (USA)). 1983. Contract FG44-80R410080. 4p. NTIS, PC A02/MF A01. Order Number DE84000711.

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A solar laundry was installed on a college campus in South Carolina, including two separate systems installed in parallel. (LEW)

57072 **(DOE/R4/10083—T1) Energy conservation and solar heating for mobile homes.** (Ward (W. Terry), Lebanon, KY (USA)). [nd]. Contract FG44-80R410083. 12p. NTIS, PC A02/MF A01. Order Number DE84000427.

Project activities consisted of retro-fitting six (6) mobile homes with extensive energy-conservation improvements and installing solar-space-heating systems on four (4) of these homes. The intent of the project was to evaluate the potential of mobile homes as a low-cost energy-efficient housing option for low- to moderate income families. Using both hard and soft data, it is estimated that an average fuel reduction in excess of 35% was achieved by the conservation improvements alone. The project lacked the expertise and monitoring instruments to properly evaluate the effectiveness of the four solar installations and had to rely on the personal observations of the four families that received the units.

57073 **(DOE/R4/10086—T1) More power to you: a solar-greenhouse project. Final report.** (Mountain Community Workshop, Berea, KY (USA)). [nd]. Contract FG44-80R410086. 15p. NTIS, PC A02/MF A01. Order Number DE84000372.

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A solar heated and food producing greenhouse was constructed, primarily from scavenged and surplus materials, and its performance was observed. (LEW)

57074 **(DOE/R4/10095—T1) Investigation of the performance of the Windjammer solar system.** Ingley, H.A.; Dixon, R. (Florida Univ., Gainesville (USA)). Mar 1982. Contract FG44-80R410095. 36p. NTIS, PC A03/MF A01. Order Number DE84000960.

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The University of Florida's Solar Energy Laboratory was contracted to test and evaluate the Windjammer solar water heater system. This system was a forced circulation/batch mode hybrid system. The approach taken compared the performance of the Windjammer innovative system to the performance of a conventional open loop solar water heating system. The system prototype was constructed such that it could be configured for operation in the innovative or conventional mode. Comparisons of the two operational configurations with systems comprised of identical equipment was therefore possible. The data presented in this report are for the performance of the innovative and conventional system configurations for winter and late spring/early summer conditions.

57075 **(DOE/R4/10095—T2) Windjammer solar-water-heating system. Final technical report.** Windham, J.R. (Florida Univ., Gainesville (USA)). Apr 1982. Contract FG44-80R410095. 25p. NTIS, PC A02/MF A01. Order Number DE84000734.

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The results of the Windjammer Solar-Water-Heating System tests showed that it was not as an efficient system as a comparable conventional system for converting solar energy into heat energy. However, it was determined that the innovative mode used less electric back-up energy for water heating. Reduced fossil fuel energy consumption being the ultimate objective of a solar water heating, the principle employed has been shown to be a workable energy saving concept. The differential mode of temperature control emerged as the more efficient mode of operation for the innovative system and under comparable conditions is projected to be nearly equivalent to the conventional solar system. Although the concept has proven workable, the costs feasible, and the potential for considereable improvements exists, additional research and development is needed to advance the design into its most practical application.

57076 **(DOE/R4/10096—T1) Solar liquid-desiccant air-conditioning system. Final report.** (Solar Engineering Co., Casselberry, FL (USA)). [nd]. Contract FG44-80R410096. 19p. NTIS, PC A02/MF A01. Order Number DE84000732.

A design for a closed, diurnal, intermittent absorption chiller for passive solar air-conditioning using liquid sorbents has been constructed and tested. LiBr-H_2O will not work with this design because of its low vapor pressure at the temperature available. The approach has possibilities using the 2 LiBr-ZrBr-CH_3OH or H_2O-NH_3 sorbent refrigerant pairs. The use of H_2O-NH_3 appears to be the better candidate because of the lower solution viscosity and less cycle weight, through tank volumes and collector requirements are similar. Further study of other refrigerant pairs such as S-Thiocyanate-ammonia is indicated, however, the difficulties encountered in construction and low potential coefficient of performance, and thus large collection area needed, makes commercialization of such a system doubtful in the foreseeable future.

57077 **(DOE/R4/10101—T1) Solar-assisted electric clothes dryer using a home attic as a heat source.** Stana, J.M. (Energy Alternatives, Longwood, FL (USA)). [nd]. Contract FG44-80R410101. 80p. NTIS, PC A05/MF A01. Order Number DE84000746.

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This study was undertaken to determine the suitability of using a southeastern home attic as a means of reducing the energy consumption of an electric clothes dryer. An inexpensive duct (duplicable for $25) was constructed to collect hot attic air from the peak of a south facing roof and introduce it into the dryer inlet. Instrumentation was added to measure inlet temperatures and operating time/energy consumption of the dryer. Standardized test loads, in addition to normal laundry, were observed over the period of one year. The heat-on time of the dryer tested was shown to be reduced .16 to .35 minutes per °C rise in inlet temperature. Inlet temperatures produced by the attic duct peaked at 56°C(133°F) in May/June and 40°C(104°F) in February. Based on peak temperatures available between 2 and 4 pm each month, a potential 20% yearly average savings could be realized. Economic viability of the system, dependant primarily on dryer usage, can be computed using a formula derived from the test results and included in the report.

57078 **(DOE/R4/10104—T1) Freeze-protection loop for direct solar-water-heating systems. Final report.** (SOLAR-FIN, St. Augustine, FL (USA)). 4 Nov 1981. Contract FG44-80R410104. 9p. NTIS, PC A02/MF A01. Order Number DE84000754.

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Even a one-time freeze condition can do destructive damage to a direct solar water heating system. The project funded under grant DE-FG4480R4, 1-1-80 to 8-1-81, proposed to demonstrate a simple installation procedure whereby thermosiphoning warm water from storage would prevent solar collectors from freezing. Installing the freeze protection loop in owner maintained solar systems was inconclusive. Owners were not attentive to freeze warnings or did not understand the simple instructions. A controlled situation was established using a refrigerator to produce below freezing temperatures. Experiments conducted with this equipment showed that the thermosiphoning principle could not be relied on to prevent freezing. Thermosiphoning cannot be relied on to prevent freezing in a direct solar water heating system. The direct system is an effective means of heating water in north Florida, but the system must be drained, either manually or automatically, to provide reliable system protection.

57079 **(DOE/R4/10114—T1) Inherent freeze protection for solar water heaters.** Jeter, S.M.; Leonaitis, L.L.; Leonaitis, L.L. (Jeter (Sheldon M.), Atlanta, GA (USA)). May 1981. Contract FG44-80R410114. 55p. NTIS, PC A04/MF A01. Order Number DE84000392.

Research and development of a method for protection of a solar collector from freezing is described. The method is shown to be technically and economically feasible. A prototype water heating system using the inherent freeze protection method was successfully operated during the winter of 1980 to 1981.

57080 **(DOE/R4/10119—T1) Solar greenhouse project. Final technical report.** (Charlotte Area Fund, Inc., NC (USA)). 3 Jun 1983. Contract FG44-80R410119. 25p. NTIS, PC A02/MF A01. Order Number DE84000277.

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Three (3) passive solar greenhouses were constructed as lean-to attachment to the homes of three (3) low-income families in Mecklenburg County, North Carolina as a demonstration project. CETA labor was provided by a training and work experience project for home repair and construction skills. Some of the walls were constructed from old salvaged windows and a local block company donated blocks that were used for the foundation. Recipients of the greenhouses reported reduced air drafts and fuel consumption savings. Flowers and vegetables were successfully grown during the winter months.

57081 **(DOE/R4/10138—T1) Solar-heated Volunteer Fire Department in Brasstown, NC. Final report.** Boone, R. (Solar Plexus Design, Warne, NC (USA)). [nd]. Contract FG44-80R410138. 7p. NTIS, PC A02/MF A01. Order Number DE84000276.

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Two vertical wall, forced air, back-pass solar collectors were site-built onto the south wall of the Brasstown Volunteer Fire Department building wich is under construction. A 750 ft^3 rock bed was installed and covered with a 6" concrete slab providing parking bays for the fire department's water tanker trucks. All these materials are charged with solar heated air from the collectors to maintain warm trucks ready to start in short notice. A community room is also maintained at a comfortable temperature for activities during the winter.

57082 **(DOE/R4/10141—T1) NCSU solar energy and conservation house. Final report.** (North Carolina State Univ., Raleigh (USA). Dept. of Mechanical and Aerospace Engineering). Oct 1981. Contract FG44-80R410141. 19p. NTIS, PC A02/MF A01. Order Number DE84000389.

A passive solar energy house has been built adjacent to the NCSU McKimmon Continuing Education Center. The house contains a two-story embedded sunspace, two Trombe walls, active solar hot water heating, thermal storage in a rock filled ceiling/floor, and numerous research treatments, and energy conservation features. (See attached photo brochure; Appendix 1). The house is completely decorated and furnished in an attractive manner and the exterior architecture is traditional and has broad consumer appeal. It is also thoroughly instrumented to monitor performance. The house is open to the public on weekends and numerous people come to visit on their own initiative and others take advantage of the close proximity to McKimmon while there attending conferences. The house will influence and motivate large numbers of people to consider solar and energy conservation facets in their homes and will provide data to substantiate performance to prospective home buyers and meaningful data on design and construction for builders.

57083 **(DOE/R4/10155—T1) Experimental study of a fiber absorber-suppressor modified Trombe wall.** Choudhury, D.; Birkebak, R.C. (Kentucky Univ., Lexington (USA). Dept. of Mechanical Engineering). Dec 1982. Contract FG44-80R410155. 129p. NTIS, PC A07/MF A01. Order Number DE84000426.

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An experimental study has been conducted to ascertain the effects of introducing fiber bed absorbers on Trombe wall passive solar collectors. Two identical, Trombe wall passive solar units were constructed that incorporate the basic components of masonry collector-storage walls: glazings, masonry and thermal insulation. Both units were extensively instrumented with thermocouples and heat flux transducers. Ambient temperature, relative humidity, wind speed and insolation are also measured. In the first part of the study the two Trombe wall units were tested with a single glass cover. The thermal performance of both units was found to be virtually identical. In the second part of the study a single cover Trombe wall unit was compared with a double cover unit and the latter was found to have higher air gap and masonry wall temperatures and heat fluxes. In the final phase of the experiment, an absorbing, scattering and emitting fiberglass-like material was placed in the air gap of the single gazed wall. Tests were conducted to compare the solar-thermal performance, heat loss and gain characteristics between the units with and without the fiber absorber-suppressor. This experiment showed that the fiber bed served to decouple the wall at night from its exterior environment and to reduce the heat losses. The modified Trombe wall with the fiber absorber-suppresor out-performed the double glazed Trombe wall system by approximately ten percent gain in useable thermal energy. Also, the fiber bed eliminates one glazing thereby reducing system cost as well.

57084 **(DOE/R4/10204—T1) Low-cost damper actuator for solar systems. Final technical report.** (Shuder (C.B.), Boomer, NC (USA)). 1981. Contract FG44-80R410204. 15p. NTIS, PC A02/MF A01. Order Number DE84000281.

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A damper actuator for solar systems was designed, constructed, and evaluated. The device utilized simple, low-cost electronic components and solenoids from discarded household appliances. The final prototype was thoroughly tested and met initial expectations as to ruggedness, reliability, and cost. Performance was satisfactory although operating speed was higher than originally specified. Construction and application data was documented so that others could construct similar devices to meet specific energy system requirements.

57085 **(DOE/R4/10217—T1) Solar air conditioning.** Robison, H. (Robison (Harry), Pawleys Island, SC (USA)). 1981. Contract FG44-80R410217. 9p. NTIS, PC A02/MF A01. Order Number DE84000706.

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Development of a hybrid solar-assisted air conditioning system that combines a vapor compression section for sensible cooling with a desiccant section for dehumidification and that uses both solar energy and condenser waste heat to drive the dehumidifier has been under way for the last two years (1981 and 1982). The results of this research are included in this report: utilizing solar energy in an economical way has proven quite difficult.

57086 **(DOE/R4/10221—T1) Return-air bypass hot-air solar-heating system. Final report.** (Piedmont Technical Coll., Greenwood, SC (USA)). [nd]. Contract FG44-80R410221. 8p. NTIS, PC A02/MF A01. Order Number DE84000699.

The project is the design and construction of a hot-air solar-space-heating system using a collector in combination with conventional mechanical equipment to provide heat for a portion of a building during the day when solar gain is available. The system operation consists primarily of utilizing the conventional-system heat-pump air handler to circulate the building air through a hot-air solar collector by way of by-passing the conventional-return air ducts. The building air is heated in the collector and circulates to the return air side of the air handler and is distributed back into the building through the conventional-system supply ducts. The system incorporates the use of simple thermostat-operated dampers and no storage capability for a less-complex operation than those solar systems requiring sophisticated controls and varying modes of operation.

57087 (DOE/R4/10266—T1) Active residential solar-heating system. Final technical report. Rosander, R.T. (Rosander (R.T.), Young Harris, GA (USA)). [nd]. Contract FG44-80R410266. 7p. NTIS, PC A02/MF A01. Order Number DE84000786.

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The purpose of this project was to design and build an active residential solar-heating system, using air as the transfer medium and using solar collectors of such design that the average handyman could build them in a home workshop. Further to this, the feasibility of using a phase change salt as a storage medium was investigated and some good test results were obtained for use in future designs.

57088 (DOE/R4/10268—T1) Earth-cooled air conditioning. Final report. Shields, D. (Shields Construction Co., Atlanta, GA (USA)). 6 Jan 1981. Contract FG44-80R410268. 14p. NTIS, PC A02/MF A01. Order Number DE84000784.

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This project attempted to find some basic performance data for an earth-sink air conditioning system. The system failed to perform adequately, for reasons which may relate more to the approaches used than to the viability of the basic idea. Some possible reasons for the lack of performance are discussed in detail in the body of the report.

57089 (DOE/R4/10290—T1) Developing and demonstrating low-energy climate control and production techniques for greenhouse-grown citrus and ornamental crops. Bodnaruk, W.H. Jr. (Bodnaruk (William H., Jr.), Tavares, FL (USA)). Apr 1983. Contract FG44-80R410290. 29p. NTIS, PC A03/MF A01. Order Number DE84000403.

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The aim of this study was to develop and demonstrate low energy climate control and production techniques for greenhouse grown citrus and ornamental crops. Emphasis was placed on design, fuel efficiency and plant response to warm water soil heating systems using solar energy and LP gas. An energy requirement of 28Btus output per hour per square foot of bed space will provide soil temperature of 70°F minimum when air temperatures are maintained at 60°F. Soil heating to 70° increased rooting and growth of 8 foliage plant varieties by 25 to 45% compared to plants grown under 60°F air temperature conditions. Providing soil heating, however, increased fuel consumption in the central Florida test facilities by 30% in the winters of 1980-81 and 1981-82. Solar tie-in to soil heating systems has the potential of reducing fuel usage. Solar heated water provided 4 hours of soil heating following a good collection day. Decreased in-bed pipe spacing and increased storage capacity should increase the solar percentage to 6 hours.

57090 (DOE/R4/10403—T1) Solar preheater for residential heat pumps. (Lane (F. Berry), Waddy, KY (USA)). [nd]. Contract FG44-81R410403. 13p. NTIS, PC A02/MF A01. Order Number DE84000767.

The Solar Preheater for Residential Heat PUmps was designed to offset the weakest points in a heat pump system using solar energy. These weak points affect both energy efficiency and comfort, and are: (1) the heat pumps need to defrost its outside coils, and (2) its use of resistance coils when outside air is very cold. While a heat pump can claim close to 100% efficiency in its conversion of electricity to heat, these efficiencies drop way off under the above circumstances. Less dramatic energy savings should also occur during the heat pump's normal operation, since a heat pump takes available heat and condenses it to heat the house. It seems reasonable to say that if there is more heat in the outside air it will take less time to raise the temperature inside. The net effect should be similar to having the heat pump located several hundred miles south of the home it is heating. There are several ways to achieve solar augmentation of heat pump operation, but most are either too expensive, too difficult for do-it-yourselfers, or are not easily adaptable to existing units. The solar preheater for residential heat pumps gets around all the above restrictions.

57091 (DOE/R4/10423—T1) Integral collector and storage - solar system. Final report. (Saint Nicholas Speech and Hearing Center, Greenwood, SC (USA)). 1982. Contract FG44-81R410423. 10p. NTIS, PC A02/MF A01. Order Number DE84000694.

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The project is the Design and Construction of a Hot Air Solar Space Heating System that will provide heat for a facility in which operating hours (and subsequently peak heating loads) occur during the day when solar gain is available. The system operation consists primarily of utilizing the conventional system heat pump air handler to circulate the building air through a hot air solar collector by way of by-passing the conventional return air ducts. The building air is heated in the collector and circulates to the return air side of the air handler and is distributed back into the building through the conventional system supply ducts. The job built hot air collector construction includes concrete providing a thermal lag capacity that will extend the solar participation and provide heat beyond the period of solar gain. By incorporating an element of heat storage as a part of the collector, the air will not be overheated during times of peak collection and heated air will be available to the building into the late afternoon and evening.

57092 (DOE/R4/10445—T1) Model of a solar-powered cooling unit for a small area. Jones, E.E. (Jones (E.E.), Mobile, AL (USA)). [nd]. Contract FG44-81R410445. 11p. NTIS, PC A02/MF A01. Order Number DE84000932.

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This research attempted to construct an inexpensive cooling device. Cool well water was passed through two junk automobile radiators which were enclosed in an insulated box. Air was forced through the openings of the radiators by a fan which obtained its energy from a solar photovoltaic cell. The temperature of the well water used was 61°F and it cooled ambient air from 83°F down to 71°F. The device has limited use because of the unreliability of sunlight to drive the fan. It might be used in a small, well insulated outbuilding, shop or shed. It was designed primarily for a rural population.

57093 (LA-UR—83-2646) Vapor-phase heat-transport system. Hedstrom, J.C. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-830980—3). NTIS, PC A02/MF A01. Order Number DE84001341.

From Passive and hybrid solar energy program update conference; Washington, DC, USA (26 Sep 1983).

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A vapor-phase heat-transport system is being tested in one of the passive test cells at Los Alamos. The system consists of one selective-surface collector and a condenser inside a water storage tank. The refrigerant, R-11, can be returned to the collector by gravity or with a pump. Results from several operating configurations are presented, together with a comparison with other passive systems. A new self-pumping concept is presented.

57094 (LA-UR—83-2647) Cooling-load implications for residential passive-solar-heating systems. Jones, R.W.; McFarland, R.D. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 8p. (CONF-830980—2). NTIS, PC A02/MF A01. Order Number DE84001340.

From Passive and hybrid solar energy program update conference; Washington, DC, USA (26 Sep 1983).

Ongoing research on quantifying the cooling loads in residential buildings, particularly buildings with passive solar heating systems, is described, along with the computer simulation model used for calculating cooling loads. A sample of interim results is also presented. The objective of the research is to develop a simple analysis method, useful early in design, to estimate the annual cooling energy requirement of a given building.

1410 Solar Collectors And Concentrators

57095 (DOE/CE/71115—1) Medium-temperature cooperative solar program. Final report, July 1979-March 1983. Jaume, F.F.; Lorsch, H.G. (Instituto Nacional de Industria, Madrid (Spain); Franklin Research Center, Philadelphia, PA (USA)). [nd]. Contract AC02-82CE71115. 41p. NTIS, PC A03/MF A01. Order Number DE83018121.

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This project, started in 1979, has focused in solar collectors and heat pumps technical, economical and market studies. A survey of photovoltaics and thermal advanced technologies has also been performed. A demonstration plan has been implemented with the goal of speeding the diffusion of solar collectors and heat pumps in Spain and thereby reduce fuel imports.

57096 (DOE/CS/30583—T1) SUPERGLASS. Engineering field tests - Phase 3. Production, market planning, and product evaluation for a high-thermal-performance insulating glass design utilizing HEAT MIRROR transparent insulation. Final report. Tilford, C.L. (Southwall Corp., Palo Alto, CA (USA)). Nov 1982. Contract FC02-80CS30583. 110p. NTIS, PC A06/MF A01. Order Number DE84000461.

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HEAT MIRROR transparent window insulation consists of a clear polyester film two mils (.002") thick with a thin, clear low-emissivity (.15) coating deposited on one side by state-of-the-art vacuum deposition processes. This neutral-colored invisible coating reflects long-wave infrared energy (heat). When mounted by being stretched with a 1/2" air-gap on each side of the film, the resulting unit reduces heat loss by 60% compared to dual insulating glass. Southwall Corporation produces HEAT MIRROR transparent insulation and markets it to manufacturers of sealed insulating glass (I.G.) units and window and building manufacturers who make their own I.G. These companies build and sell the SUPERGLASS sealed glazing units. Units made and installed in buildings by six customers were visited. These units were located in many geographic regions, including the Pacific Northwest, Rocky Mountains, New England, Southeast, and West Coast. As much as could be obtained of their history was recorded, as was their current condition and performance. These units had been in place from two weeks to over a year. All of the units were performing thermally very well, as measured by taking temperature profiles through them and through adjacent conventional I.G. units. Some units had minor visual defects (attributed to I.G. assembly techniques) which are discussed in detail. Overall occupant acceptance was enthusiastically positive. In addition to saving energy, without compromise of optical quality or appearance, the product makes rooms with large glazing areas comfortable to be in in cold weather. All defects observed were present when built; there appears to be no in-field degradation of quality at this time.

57097 (PB—83-239897) Termiska prestanda foer solfangare: tre ars utomhusexponering av elva olika fabrikat (thermal performance of solar collectors: three years of outdoor exposure of eleven different products). Ekstroem, L.A. (Statens Provningsanstalt, Boraes (Sweden)). May 1982. 104p. (SP-RAPP—1982:18). NTIS, PC E06/MF E01.

Information on thermal performance of solar collectors subject to prolonged outdoor exposure has been lacking. Question is in which way changes caused by aging of materials affect thermal performance. Eleven different solar collectors were mounted on a roof for 3 years without circulating liquid, for which reason thermal stress accelerated their aging. They were subject to ocular inspection, and their degree of effectiveness was measured in solar simulator or outdoors. Components of interest in this context were: the covering disc, absorption surface, contact joint, if any, between absorption surface and pipes, insulation and casing. Relationship between condition of these components and some interesting solar collector parameters may give valuable information on influence of different defects on efficiency. Results of study show that efficiency is only somewhat lower than for corresponding new products.

57098 (SERI/TR—255-1627) Matrix approach to testing mirrors. Part 2. Masterson, K.; Czanderna, A.W.; Blea, J.; Goggin, R.; Gutierrez, M.; Jorgensen, G.; McFadden, J. (Solar Energy Research Inst., Golden, CO (USA)). Jul 1983. Contract AC02-77CH00178. 106p. NTIS, PC A06/MF A01. Order Number DE83011996.

This report describes the experimental work and results from the second phase of the Matrix Approach to Testing Mirrors (MATM). Mirror specimens are subjected to heat, water vapor, pollutants, ultraviolet light, and mechanical stress for up to eight weeks. Analysis concluded that the degradation rates are very sensitive to temperature; above 95° to 100°C, agglomeration causes the silver film to degrade rapidly; degradation is more severe in high humidity pollutants did not substantially alter the degradation rates; ultraviolet light did not significantly alter the degradation of solar reflectance; no synergistic effects were observed; specular and hemispherical reflectance techniques detect and quatify the early stages of degradation; and darkfield microphotography is a good technique for studying mirror degradation.

1420 Heat Storage

57099 (PB—83-240390) Seasonal storage of solar heat: utilization of surface and ground water by means of large-scale heat pumps. Lemmeke, L. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1983. 60p. NTIS, PC E04/MF E01.

At the end of 1980, one of the municipalities in the south of Sweden invited VBB-SWECO to submit a basic proposal for a heat supply plant to serve the central part of the municipality, the proposal was to be based on the utilization of local energy resources. In this context, particular mention was made of local resources in the form of ground water and sea water.

57100 (PB—83-241976) Thermal heat storage in hygroscopic materials for air-based solar heating systems. Final report. Verdonschoot, J.K.M. (Commission of the European Communities, Luxembourg). [nd]. 123p. (EUR—8172-EN). NTIS, PC E06/MF E06.

The development of a thermal storage system based on heat of adsorption in hygroscopic materials in air-based solar-heating systems is discussed in the first part of the report. The second part deals with the development of a theoretical model whereby calculations can be made to test the feasibility of applying an adsorbent system to solar cooling systems.

15 GEOTHERMAL ENERGY

REFER ALSO TO CITATION(S) 56996, 56997, 56998

1501 Resource Status And Assessment

REFER ALSO TO CITATION(S) 56924

57101 (N—8322678) Geothermal. (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 18p. NTIS, PC A05/MF A01.

New Mexico's geothermal resource potential, as exhibited in more than 300 known thermal springs and wells, exists primarily in association with Quaternary faulting, such as along the Rio Grande rift, or in association with Quarternary volcanic activity. Detailed areas and sites of geothermal prospects having potential for both electrical and thermal uses are listed. Considerable amounts of geological, hydrological, electrical resistivity, gravity, magnetic, seismic, water and subsurface temperature data have been compiled and analyzed.

57102 Hydrothermal resources of western Colorado. Pearl, R.H. (Colorado Geological Society, Denver). *Field Conference Guidebook (New Mexico Geological Society);* 32: 333-335(1981). (CONF-8110216—). Contract AS07-77ET28365.

From 32. New Mexico Geological Society field conference; Grand Junction, CO, USA (8 Oct 1981).

The hydrothermal geothermal resources of western Colorado are a largely untapped resource that appear able to supply large amounts of energy for a variety of purposes. Before this development can occur better resource definition is needed to accurately define the location, size, and temperatures of the individual systems. An active group of developers are needed who are willing and able to develop and sell the low to moderate temperature geothermal resources. (JMT)

1503 Geothermal Exploration And Exploration Technology

57103 **Geothermal analysis at the wellhead.** Whitaker, R.; Roberts, V.; Jackson, J. *EPRI (Electric Power Research Institute) Journal;* 8: No. 6, 28-32(Jul-Aug 1983).

Three years of experience with a mobile geothermal laboratory has produced some evolution in its use in both the conduct of analyses and their purpose. The initial demonstration at East Mesa, California was intended mainly to check the operability of all equipment after a 250-mile trip and to test the fluid-sampling system under field conditions. In addition, this demonstration led the Electric Power Research Institute (EPRI) to formalize and structure the routine now used for sample collection and analyses.

1506 Environmental Aspects And Waste Disposal

57104 **(LBL—14519) Studies of injection into naturally fractured reservoirs.** Boedvarsson, G.S.; Lai, C.H. (Lawrence Berkeley Lab., CA (USA)). Oct 1982. Contract AC03-76SF00098. 8p. (CONF-821007—14). NTIS, PC A02/MF A01. Order Number DE84001041.

From Annual geothermal resources council meeting; San Diego, CA, USA (11 Oct 1982).

A semi-analytical model for studies of cold water injection into naturally fractured reservoirs has been developed. The model can be used to design the flow rates and location of injection wells in such systems. The results obtained using the model show that initially the cold water will move very rapidly through the fracture system away from the well. Later on, conductive heat transfer from the rock matrix blocks will retard the advancement of the cold water front, and eventually uniform energy sweep conditions will prevail. Where uniform energy sweep conditions are reached the cold waer movement away from the injection well will be identical to that in a porous medium; consequently maximum energy recovery from the rock matrix will be attained. The time of uniform energy sweep and the radial distance from the injection well where it occurs are greatly dependent upon the fracture spacing, but independent of the fracture aperture.

1508 Geothermal Power Plants

57105 **(EGG-M—00183) Performance of a 5-MW(e) binary geothermal-electric power plant.** Bliem, C.J.; Fullmer, K.S.; Kochan, R.J. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 6p. (CONF-830812—57). NTIS, PC A02/MF A01. Order Number DE84000893.

From 18. intersociety energy conversion engineering conference; Orlando, FL, USA (21 Aug 1983).

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A 5-MW(e) Pilot Geothermal Power Plant was built by the Idaho National Engineering Laboratory (INEL), at Raft River, Idaho, as an integral part of the Department of Energy's plan for commercial development of geothermal energy. The purpose of the plant was to investigate the technical feasibility of utilizing a moderate temperature hydrothermal resource (275 to 300°F) to generate electrical power in an environmentally acceptable manner. The plant used a dual-boiling binary cycle with isobutane as the working fluid, and drew thermal energy from a 280°F liquid-dominated resource. This paper presents the results of that testing, and compares both component and system performance to the performance predicted prior to operation.

1509 Geothermal Engineering

REFER ALSO TO CITATION(S) 57307

57106 **(EUR—7835-EN) Low enthalpy geothermal process materials selection, corrosion prevention and scaling problems.** Louwrier, K.P.; van Riemsdijk, A.J. (Commission of the European Communities, Brussels (Belgium). Directorate General for Science, Research and Development). 1983. 108p. Commission of the European Communities, Luxembourg.

At the request of the Commission of the European Communities, Directorate General for Research, Science and Education, a start was made on a review of the "State of the Art" concerning materials selection, corrosion and fouling (scaling) of low enthalpy geothermal equipment. The information gathered has been divided into two types: - information based on practical experience in geothermal processes; - information derived from experience in other industries where process conditions resemble those of certain parts of geothermal plants. Experience originating from (low enthalpy) geothermal plants is still fragmentary. The oil industry is the best information source concerning production and reinjection wells. There are a number of state of the art reports available which are in some part fully relevant to the subject on hand. They have been reproduced in part or in full and appended to this report.

57107 **(EUR—8369-EN) Scaling in geothermal ventures.** Louwrier, K. (Commission of the European Communities, Luxembourg. Directorate-General for Science, Research and Development). 1983. 28p. Commission of the European Communities, Luxembourg.

The literature on scaling in geothermal ventures has been screened using the data bases of EDF-Doc, Pascal, Tulsa Compendex and N.T.I.S. This has been done in cooperation with the Institut Francais du Petrole in the framework of contract FG-B-Y-102-F. Literature from 1976 till 1981 has been included. Some abstracts are in English others in French. All tiltles are at least in English.

1520 Geothermal Data And Theory

REFER ALSO TO CITATION(S) 57413, 57414, 57415, 57416, 57744, 57745, 57746, 57747, 57748, 57749, 57750, 57751, 57759

17 WIND ENERGY

REFER ALSO TO CITATION(S) 56996, 56997, 56998

1706 Wind Energy Engineering

REFER ALSO TO CITATION(S) 57065

57108 **(DOE/R4/10093—T1) Low-cost windmill that could be manufactured from local materials. Final report.** Donaldson, J.C. (Donaldson (Jesse C.), Cocoa, FL (USA)). [nd]. Contract FG44-80R410093. 4p. NTIS, PC A02/MF A01. Order Number DE84000735.

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Two model windmills are described briefly. The first is a two-bladed rigidly mounted model with a weather vane for locking the blades in a neutral position in high winds. The second is a three-bladed model mounted on a flexible tower that bends in high winds. The three-bladed model is equipped with a flywheel. Publicity for the windmills is also described briefly. (LEW)

57109 **(DOE/R4/10149—T1) Investigation into the feasibility of wind as an alternate energy resource at selected North Georgia sites.** Brock, D.L. (North Georgia Coll., Dahlonega (USA)). 26 Oct 1982. Contract FG44-80R410149. 8p. NTIS, PC A02/MF A01. Order Number DE84000776.

Anemometers were placed at four selected sites in North Georgia during the period July, 1980, to June, 1982. Regular wind

speed readings were taken using accumulating recorders and average daily wind speeds calculated for each location. Three wind speed categories were determined: (a) average below 7 mph; (b) average between 7 and 25 mph; (c) average above 25 mph. One site was abandoned after seven months due to lack of expected wind; another site was closed after 4.5 months due to continuing excessive and damaging winds. Two sites were determined, after 12 to 20 months of data collecting respectively, to have sufficient wind resources in a usable time pattern to merit further investigation.

57110 **(DOE/R4/10189—T1) Small-scale wind-power demonstration project.** Mackey, J.L. (Appalachian State Univ., Boone, NC (USA)). 6 May 1982. Contract FG44-80R410189. 7p. NTIS, PC A02/MF A01. Order Number DE84000287.

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This project involved the installation of two small wind generators. One generator was placed in Doughton Park on the Blue Ridge Parkway. This system interfaced with the Blue Ridge Electric Membership Cooperative (BREMCO) power grid. The other generator was located at the Valle Crucis Mission School as a part of the Earth Studies Demonstration Program. This system interfaced with the Mountain Electric Cooperative power grid. The purposes of the project would be to provide demonstrations of (state-of-the-art) small scale wind generators for the Southern Appalachian region, to collect data on the operation and performance of such systems, and to provide utilities of this region with operating experience with such systems. The Earth Studies wind generator would be used for instruction in the University.

57111 **(DOE/R4/10212—T1) Wind-powered generator. Final report.** Whitesides, R.E. (Whitesides (R.E.), Lincolnton, NC (USA)). [nd]. Contract FG44-80R410212. 4p. NTIS, PC A02/MF A01. Order Number DE84000432.

Completion of a wind energy conversion system for a private home is reported. The system included three blades constructed of an aluminum center with marine plywood sandwiched between the aluminum center and the fiberglass outer covering. The wind turbine drives a 1800 rpm generator by a chain drive mechanism. Battery storage is included. (LEW)

57112 **(DOE/R4/10284—T1) Wind hydroelectric performance. Final report.** Griggs, F.H. (Griggs (Fred H.), Dallas, TX (USA)). 1982. Contract FG44-80R410284. 5p. NTIS, PC A02/MF A01. Order Number DE84000789.

A brief discussion is given on a residential power system consisting of a windmill, well pump, turbine, generator, and storage batteries. (LEW)

57113 **(DOE/R4/10316—1) Demonstration of wind turbine. Final technical report at grant program.** Pendola, W. Jr. (Pendola (William, Jr.), Sarasota, FL (USA)). Jun 1982. Contract FG44-80R410316. 21p. NTIS, PC A02. Order Number DE84000415.

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Proposal F-602 is a demonstration of a commercially available wind-electric device - an Enertech Corp. Series 1800 model wind turbine. The demonstration site selected was the New Directions school campus, a public school facility, in Sarasota, Florida. During testing, an investigation of the wind power potential for the area was undertaken. In addition, negotiations with the Florida Power and Light Company for parallel operation of the wind system (utility interface), were initiated. An Operating Agreement contract is now pending approval by the Sarasota County School Board. The results to date, of this site's wind power potential, have been well below computational expectancies based upon wind speed data for the area. Analysis will continue, to determine the cause of the windplant's low net output.

57114 **(DOE/R4/10319—T1) Installation of wind generator. Final technical report.** Klinzman, R.T. (Klingman (Richard T.), West Palm Beach, FL (USA)). [nd]. Contract FG44-80R410319. 46p. NTIS, PC A03/MF A01. Order Number DE84000328.

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This report describes the objectives, installation, problems, conclusions, and recommendations in the assembly of a wind driven generator for supplying electric power. The report lists many of the unforeseen pitfalls that must be overcome. These problems are not generally known until a project of this type is underway. Many of the problems I have had to contend with can be derived from the body of this report and researched for local compliance. The single most important object of this project was to determine the energy saving potential of a wind generator used in a family residence.

57115 **(DOE/R4/10496—T1) Blade-pitch control mechanism for vertical-axis wind turbines. Final technical report.** De Geus, A.M. (S.R.D. Corp., Eastover, SC (USA)). Dec 1981. Contract FG44-81R410496. 26p. NTIS MF A01. Order Number DE84000696.

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The objective of the work reported is to develop a reliable, uncomplicated pitch-control mechanism for vertical axis wind power generators. The mechanism proposed eliminates the vane-oriented cam track used in other pitch-control mechanisms. The critical area of construction is the sliding pivot point/slotted support construction. (LEW)

57116 **(DOE/R4/10503—T1) Development of a vertical-shaft windmill for areas with low annual average windspeeds.** Goodin, J.R. (Goodin (James Ronald), Louisville, KY (USA)). 1980. Contract FG44-81R410503. 83p. NTIS, PC A05/MF A01. Order Number DE84000315.

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A national commitment has been made to develop renewable sources of energy. Wind and solar energy have received the most attention. The scope of this thesis is to investigate aspects and technical feasibility of a windmill that could capture the low speed winds that ocur in many regions of this nation. Tradeoff's of cost vs efficiency are included. An aerodynamic computer program was developed to predict the performance of the windmill. A model of the system was constructed, tested and the results of the test compared to the data originally predicted by the aerodynamic computer program.

57117 **(ECN—83-099) Efficiencies of the 25 m HAWT (wind turbine) at ECN, Petten, Netherlands.** Dekker, J.W.M.; de Groot, C.M.; Jacobs, J.L. (Stichting Energieonderzoek Centrum Nederland, Petten). Jun 1983. 32p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

From the ECN, Petten, Netherlands, horizontal axis wind turbine with 25 m rotordiameter (25 m HAWT) were determined experimental values of the power coefficient Cp, the axial force coefficient Cd and the couple-axial force ratio Q/(F.R) = Cq/Cd. The measurements were conducted at wind velocities between 5 and 10 m/sec, at a revolution number of about 4 rad/sec and at a speed angle of theta = 0 degrees. The maximal value of Cp is reached at a speed velocity of lambda = 8. This experimental value (Cp = 0.4) is about 15% lower than calculated. The measured axial force coefficient Cd, even at lambda = 8, is 0.6 whereas the calculated value equals to 0.8. Measured were conversion efficiency of the combination transmission year and electric generator as function of the input. Measured was at full load (P > 250 kW) an efficiency of 0.92. Calculated was the energy yield per year as function of different control strategies. (10 graphs, 4 tables).

57118 **(ECN—83-106) Performance tests of the Pionier-1 15 m vertical axis wind turbine.** Machielse, L.A.H. (Stichting Energieonderzoek Centrum Nederland, Petten). Jun 1983. 15p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

The 15 m vertical axis turbine is equipped with a d-c generator with mutator. The power yield is not measured directly. The product of the electrical magnitudes tension and strength of current both measured at the armature of the d-c generator is the delivered electrical power. The supplied wind power is measured with an anemometer. In order to measure the number of revolutions of the wind turbine the d-c generator was equipped with a tacho generator. The above mentioned 4 measuring signals were conditioned to

a digital signal and as such delivered to a minicomputer system as performance parameters.

57119 **(ECN—83-108) Simple calculations of fuel savings at wind power-diesel combinations for electricity generation.** Oei, T.D. (Stichting Energieonderzoek Centrum Nederland, Petten). Jul 1983. 10p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

Calculations of fuel savings were made for an autonomous electrical grid (island service) where the electrical power was generated by a combination of a wind turbine and one or two diesel engines. Presented are calculations of a wind turbine with a maximal power of 14 kW in combination with (a) one diesel engine of 12 kW, (b) one diesel engine of 48 kW, and (c) two diesel engines of 2x24 kW.

57120 **(ECN—83-109) Grid tension fouling caused by a mutator coupled to a wind turbine with a nominal power of 300 kW.** Looijesteijn, C.J. (Stichting Energieonderzoek Centrum Nederland, Petten). Jun 1983. 16p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

Described are measurements for determining the amount of harmonic deformation of grid tension (grid fouling) caused by a mutator coupled to a dc wind generator. The wind generator is a 300 kW wind turbine stationed at ECN, Petten, Netherlands.

20 ELECTRIC POWER ENGINEERING

57121 **(ATR—81-(7891-03)-1) New technology integration planning workshop.** (Aerospace Corp., El Segundo, CA (USA). Energy and Resources Div.). 1980. Contract AT03-76ET30351. 53p. (CONF-8008101—Summ.). NTIS, PC A04/MF A01. Order Number DE83017919.

From New technology intergration planning workshop; Harpers Ferry, WV, USA (19 Aug 1980).

Purpose of the Workshop was to provide guidance, reflecting electric utility industry viewpoints, for developing and directing its research and development program structures to facilitate the integration of new energy technologies into electric utility systems. The Workshop was structured to directly elicit the positions and viewpoints representative of electric utility companies.

57122 **(DOE/ET/20505—T1) Evaluation of higher distribution and/or utilization voltages. Final report.** (ECON, Inc., Princeton, NJ (USA)). 10 Sep 1980. Contract AC01-78ET20505. 39p. NTIS, PC A03/MF A01. Order Number DE83018211.

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An electric energy distribution/utilization system cost analysis model is presented for exploring cost tradeoffs (capital investment, operation and maintenance and cost of losses) and optimizing system configuration. The model focuses on the treatment of residential and light commercial service areas with time-varying load characteristics, including customer load profile changes, per customer load growth and service area population growth. Applications of the model are discussed. These include providing insight on: the selection of primary and secondary voltages; conductor sizing; distribution transformer sizing, change out policies and copper-to-core-loss ratio; and limits on allowable voltage variation at the service entrance. Examples are provided to illustrate model capabilities.

57123 **(DOE/ET/29035—T1) Large-scale-system effectiveness analysis. Final report.** Patton, A.D.; Ayoub, A.K.; Foster, J.W.; Hogg, G.L.; Singh, C.; Deuermeyer, B.L. (Texas A and M Univ., College Station (USA). Research Foundation). Nov 1979. Contract AS01-77ET29035. 80p. D. Order Number DE84000507.

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Objective of the research project has been the investigation and development of methods for calculating system reliability indices which have absolute, and measurable, significance to consumers. Such indices are a necessary prerequisite to any scheme for system optimization which includes the economic consequences of consumer service interruptions. A further area of investigation has been joint consideration of generation and transmission in reliability studies. Methods for finding or estimating the probability distributions of some measures of reliability performance have been developed. The application of modern Monte Carlo simulation methods to compute reliability indices in generating systems has been studied.

57124 **(DOE/ET/29138—1) Inclusion Principle for dynamic systems. Final report.** Siljak, D.D. (ed.). (Santa Clara Univ., CA (USA)). May 1982. Contract AS03-77ET29138. 173p. NTIS, PC A08/MF A01. Order Number DE84000981.

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This report is divided into two parts, Part I is devoted to the mathematical basis of the Inclusion Principle developed using the elements of matrix algebra and the geometric concepts. Only linear constant systems are considered. A suboptimal scheme is obtained for decentralized control of interconnected systems with overlapping information sets. The scheme is applied to a two-area model of Automatic Generation Control. In Part II, the Inclusion Principle is extended to nonlinear systems and made available for use with vector Liapunov functions in the context of transient stability analysis of multimachine power systems.

57125 **(DOE/ET/29328—1) Application of model algorithmic control to fossil-fueled plants.** (Scientific Systems, Inc., Cambridge, MA (USA)). Feb 1982. Contract AC01-78ET29328. 62p. NTIS MF A01. Order Number DE84000982.

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The application of Model Algorithmic Control (MAC) to fossil-fueled power plants under normal operating conditions is presented. The MAC algorithm is described and analyzed, and simulation results are presented for Astrom and Bell's linear plant model with a non-minimum phase water level response and for a nonlinear model of the Philadelphia Electric Company's Cromby II power plant.

2001 Power Plants And Power Generation

REFER ALSO TO CITATION(S) 56817, 56818, 57241

57126 **(DOE/RG—0064) Florida statewide coal-conversion study: alternatives to coal conversion for Florida utilities.** Merrill, O.H.; Schweizer, T.C.; Chernoff, H.; Conopask, J.V. (Science Applications, Inc., McLean, VA (USA)). Oct 1983. Contract AC01-80RG10426. 169p. NTIS, PC A08/MF A01. Order Number DE84001141.

This report evaluates the economics of converting 27 oil-fired generating units in Florida to coal. Conversion of these units, totaling 10,000 MW, is compared to continued use of oil (no conversion case) and increased conservation, load management, and use of unconventional power sources (conversion alternatives case). In each case, strict economic and technical criteria are used to establish feasibility and acceptability. The environmental consequences of coal conversion and alternatives to conversion are also discussed. The report finds that conversion to coal is more economical in the long-run than continued oil use but that a combination of conversions and alternatives is even more economical than full conversion. The oil units offering the best conversion economics and the alternatives (conservation, load management, cogeneration, etc.) offering the most cost-effective savings are specified. The resulting costs and fuel use effects are then quantified.

57127 **(N—8321506) Power plant concepts using new coal conversion technologies. Final Report, Dec. 1980.** Emsperger, W.; Engelhardt, R.; Goebel, K.; Schiffers, U.; Traenkenschuh, H.; Wittchow, E. (Kraftwerk Union A.G., Erlangen (Germany F.R.). Reaktorentwicklung). Mar 1982. 238p. (In German). (BMFT-FB-T—82-031). NTIS, PC A11/MF A01.

Alternatives to pulverized coal firing are presented for the use even of low grade coals in large power plant units. The unit ratings and potential efficiencies of such plants are defined and the

main determining parameters are analyzed. The problems of start up and part load operation are also discussed. The selection of gasification methods for power plant processes as a basis for power plant concepts using coal gasification is considered. The state of development of the gasification and gas scrubbing processes is described. Conceptual plant configurations and unit ratings are presented. It is demonstrated that there is an incentive to construct power plant processes that incorporate fluidized bed combustion or coal gasification but that a number of development problems remain to be solved for commercial application to become viable.

57128 **(N—8322676) Electrical generation.** (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 13p. NTIS, PC A05/MF A01.

In Energy Resources in New Mexico, p 47-59 (SEE N83-22672 12-42).

Although electricity is not a natural resource in the sense of coal or oil and gas, the electric utility industry is an integral part of the energy sector of the economy. Electricity is derived by converting one type of energy resource (oil, gas, coal, uranium) into a usable energy form (electricity) and thus has unique properties as a source of energy for the end user. Electrical energy, however, is not only important to New Mexico because electric utilities consume a portion of the natural gas and a large portion of coal resources extracted in the state, but also because electricity affects industrial growth in both the energy and non-energy sectors of the state's economy.

57129 **(ORNL/TM—8658) Coal-use handbook for conversion of heating and power-generating plants (20 to 100 million Btu/h capacity).** Reed, A.W.; DeCicco, S.G.; Hinkle, N.E.; Hunsaker, D.B. Jr.; Kornegay, F.C.; Martin, R.C.; Roop, R.D.; Sigal, L.L. (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 307p. NTIS, PC A14/MF A01. Order Number DE84001588.

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Uncertain supplies and higher costs of oil and natural gas and their derivatives have stimulated increasing interest in direct coal combustion as an energy resource. In response to the President's 1977 national energy strategy, many consumers in the public and private sector adopted goals of reducing energy consumption and dependence on nonrenewable and scarce fuels. Many heating and power plants now firing oil or gas will be converted to coal, or replaced by new coal-burning units, to help achieve these energy goals. This handbook presents technical guidance for developing and implementing conversion of heating and power plants to coal. The primary focus of information presented in the report is directed toward plants ranging in capacity from 5.9 to 29.2 MW (0.20×10^8 to 1.0×10^8 Btu/h). The handbook provides a summary of environmental and engineering considerations to be evaluated prior to and during conversion to coal and presents more detailed information directed toward assisting plant managers, facility engineers, or others in making decisions regarding coal conversions in specific cases. No two conversions are anticipated to be identical. Fuel amounts, types, and costs; space limitations; age and adaptability of existing boilers; and environmental limitations will vary among facilities and should be evaluated on a case-by-case basis. Although the handbook was prepared to assist US Army engineers in coal conversion, the information contained herein should be useful to anyone seeking to effect a similar change.

2002 Environmental Aspects

REFER ALSO TO CITATION(S) 56854

57130 **(DOE/CE/76007—1) Biological effects from high-voltage transmission lines: research guidance.** (Aerospace Corp., Washington, DC (USA)). Sep 1983. Contract AC01-82CE76007. 61p. NTIS, PC A04/MF A01. Order Number DE84001628.

Aerospace Report ATR-80(7810)-1, December 1979, presented conceptual results of a study to identify research areas and program priorities and to suggest continuing and future research to provide data for an analysis of potential human health and safety as well as of environmental risks from electric and magnetic fields, air ions, spark discharges, and conducted currents. In 1981, significant progress occurred in the engineering and biological investigations and a program reevaluation and update was reported in Aerospace Report No. ATR-81(7890)-1, July 1981. This report identifies the progress made since that report. Of particular importance are data from the Electric Power Research Institute program on 60-Hz biological effects, and the status of the research program directed by the State of New York Department of Health. This report addresses all three research programs, with particular emphasis on the DOE effort, and contains suggested direction and priorities for future efforts.

2003 Power Transmission And Distribution

REFER ALSO TO CITATION(S) 57130, 57248

57131 **(CONF-8309157—1) New particle-control techniques for gas-insulated apparatus.** Pace, M.O.; Adcock, J.L.; Christophorou, L.G. (Oak Ridge National Lab., TN (USA); Tennessee Univ., Knoxville (USA)). 1983. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE84000689.

From 4. international symposium on high voltage engineering; Athens, Greece (5 Sep 1983).

The feasibilities of two new methods of controlling contaminating particles in gas-insulated apparatus have been experimentally investigated. The first method is to coat the particles with an insulating layer: for the first time it was found that (1) coatings can render harmless particles that would otherwise lower the withstand voltage by factors of 2 to 5 and (2) coatings can be formed on particles residing in the system. The second method, trapping particles in an insulating material, was found effective also, and suitable materials were compounded for different temperature ranges.

21 NUCLEAR POWER PLANTS

REFER ALSO TO CITATION(S) 57182, 57185

57132 **(KFK—3513-B) General and special engineering materials science. Vol. 2.** Anderko, K.; Kummerer, K.R.; Ondracek, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). Apr 1983. 451p. NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751280.

Partly in Spanish.

The present report about general and special engineering materials science is the result of lectures given by the authors in two terms in 1982 at Instituto Balseiro, San Carlos de Bariloche, the graduated college of the Universidad de Cuyo and Comision Nacional de Energia Atomica, Republica Argentina. These lectures were organised in the frame of the project "nuclear engineering" (ARG/78/020) of the United Nations Development Program (UNDP) by the International Atomic Energy Agency (IAEA). Some chapters of the report are written in English, others in Spanish. The report is subdivided into three volumes. The present volume II concerns special engineering materials science with respect to nuclear materials under normal reactor operation conditions including 1. reactor clad and structural materials, 2. nuclear fuels and fuel elements, 3. nuclear waste as a materials viewpoint.

2101 Power Reactors, Non-breeding, Light-water Moderated, Boiling Water Cooled

REFER ALSO TO CITATION(S) 57163, 57172, 57183, 57343, 57346

57133 **(IKE—6-141) Detailed determination of power distribution within the fuel rods of a nuclear reactor using neutron physical and thermohydraulic computer codes.** Elzmann, H.J. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme). Feb 1983. 146p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751135.

In order to determine in detail the power- and temperature distribution within the fuel rods of a nuclear reactor a modular program system was developped which couples neutron-physical and thermohydraulic computer codes. Results of coarse-mesh calculations for the complete core were used as boundary conditions for the steady-state and transient analysis in a sub-volume of the reactor core. Special emphasis was given to the region of subcooled boiling and the determination of the temperature distribution in the fuel rods when using the program system for the design of BWR's and for calculations of transient operating conditions. The thermohydraulic calculations were performed using the subchannel-analysis as well as one-dimensional thermohydraulics. Using the program systems LUPE-COBRA-L, or LUPE-COCHA power ramps at the top-most end of the control rod displacement which compensate the fuel depletion during BWR-operation. Different displacement lengths and velocities of the control rod as well as 6 x 6 and 8 x 8 fuel rod bundles were taken into consideration.

57134 **(KFK—3541-B) General and special engineering materials science. Vol. 3.** Ondracek, G.; Hofmann, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung). Apr 1983. 200p. NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751283.

Partly in Spanish.

The report about general and special engineering materials science is the result of lectures given by the authors in two terms in 1982 at Instituto Balseiro, San Carlos de Bariloche, the graduated college of the Universidad de Cuyo and Comision Nacional de Energia Atomica, Republica Argentina. These lectures were organised in the frame of the project "nuclear engineering" (ARG/78/020) of the United Nations Development Program (UNDP) by the International Atomic Energy Agency (IAEA). Some chapters of the report are written in English, others in Spanish. The report is subdivided into three volumes. The present volume III concerns special engineering materials science and considers nuclear materials with respect to off-normal ("accident") reactor operation conditions including nuclear materials in loss-of-coolant accident and nuclear materials in core melt accidents.

57135 **(NUREG/CR—3274) Job analysis of the instrument and control technician position for the nuclear power plant maintenance personnel reliability model.** Siegel, A.I.; Bartter, W.D.; Federman, P.J. (Oak Ridge National Lab., TN (USA)). Aug 1983. Contract W-7405-ENG-26. 145p. (ORNL/TM—8754). NTIS, PC A07/MF A01 - GPO. Order Number DE84000894.

This report is one of a series that is planned to describe the results of a program undertaken by the Oak Ridge National Laboratory (ORNL) for the US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, to define, develop, validate, and disseminate a methodology for the quantitative prediction of human reliability in the conduct of maintenance tasks in nuclear power plants (NPPs). ORNL has subcontracted portions of this effort to Applied Psychological Services, Inc. This report on the job analysis of the Instrument and Control technician (NUREG/CR-3274) and a report on the job analysis of the electrician position (NUREG/CR-3275) comprise a part of the initial efforts of the development phase of this program. With the publication of the job analysis of the electrician position, the series of job analyses reports addressing nuclear power plant maintenance personnel will be complete. Subsequent reports addressing model development and validation are planned.

2102 Power Reactors, Non-breeding, Light-water Moderated, Non-boiling Water Cooled

REFER ALSO TO CITATION(S) 57134, 57135, 57153, 57165, 57172, 57178, 57180, 57184, 57187, 57188, 57189, 57190, 57293, 57346

57136 **(EGG-TMI—6272) Requirements for transporting the TMI-2 core.** Wilkins, D.E. (EG and G Idaho, Inc., Idaho Falls (USA)). Aug 1983. Contract AC07-76ID01570. 18p. NTIS, PC A02/MF A01. Order Number DE84000859.

This report summarizes the requirements associated with the actual transport of core debris from the damaged Three Mile Island Unit 2 reactor to the Idaho National Engineering Laboratory. The requirements are discussed under six headings: accountability, security, quality, safety, environment, and transportation.

57137 **(INIS-BR—20) Application of cathode protection to buried structures in nuclear power plants.** Santos, J.C.; Yukizaki, S. (ABRACO, Rio de Janeiro (Brazil); IEC Ltd., Rio de Janeiro (Brazil)). 1981. 9p. (In Portuguese). (CONF-8106271—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781104.

From 8. national seminar of corrosion; Rio de Janeiro, Brazil (10 Jun 1981).

The cathode protection systems used in the buried structures of the Unit I of Almirante Alvaro Alberto Nuclear Power Plant in Angra dos Reis, Rio de Janeiro, are described.

57138 **(NUREG/CR—3200-Vol.2) Eddy-current inspection for steam-generator-tubing program. Quarterly progress report for period ending June 30, 1983. Vol. 2.** DOdd, C.V.; Deeds, W.E.; Smith, J.H.; McClung, R.W. (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 17p. (ORNL/TM—8796-Vol.2). NTIS, PC A02/MF A01 - GPO. Order Number DE84000912.

Eddy-current inspection is the most suitable method for rapid boreside evaluation of steam generator tubing. However, small flaws can be masked by the effects of harmless variables such as tube supports. To identify the critical properties accurately and reliably in the presence of extraneous signals caused by variations of unimportant properties, sufficient information is needed to identify harmful variations and to reject harmless ones. For this reason instrumentation has been developed capable of measuring both the amplitude and phase of the eddy-current signal at several different frequencies as well as computer equipment capable of processing the data quickly and reliably. The probes and test conditions are also computer optimized. The most recent probe design embodies an array of small flat pancake coils and improves the ability to detect small flaws and to reject tube support signals. Results of the latest probe designs and measurements are shown.

57139 **(TVA/OP/EDT—83/25) Volume reduction by hyperfiltration.** Hillmer, T.; Parson, T.; Jernigan, D. (Tennessee Valley Authority, Chattanooga (USA); Carre, Inc., Seneca, SC (USA)). Jun 1983. 21p. NTIS, PC A02/MF A01. Order Number DE84900077.

Hyperfiltration (HF) testing was conducted at TVA's Sequoyah Nuclear Plant to determine the effectiveness of this method in cleaning and processing radioactive liquid streams. Preconcentration of condensate demineralizer regeneration waste solutions by HF has shown that acceptable volume reduction factors, rejection rates, and membrane useful life can be obtained while processing in situ nuclear plant waste streams. The test unit was manufactured by and purchased from Carre, Inc., of Seneca, South Carolina, with consultation on certain design parameters by the TVA project engineer and lead technical engineer. This project has provided enough beneficial information to allow design specification work on a large permanent HF unit which will be installed permanently in the plant. Ongoing tests include filtration studies on floor and tritiated drain wastes and on contaminated waste oil currently stored in 55-gallon steel drums.

57140 **(WAPD-MRP—160) Shippingport Atomic Power Station. Technical progress report, January 26, 1983-July 25, 1983.** (Bettis Atomic Power Lab., West Mifflin, PA (USA)). 1983. Contract AC11-76PN00014. 10p. NTIS, PC A02/MF A01. Order Number DE84001349.

The Shippingport Atomic Power Station ceased power operation with the Light Water Breeder Reactor core on October 1, 1982, as reported in WAPD-MRP-159. During the current report period, activity at the Station consisted of preparations for defueling, for shipment of the spent fuel to the Expended Core Facility (ECF), and for decommissioning. Defueling preparations progressed through the removal of the reactor vessel head, flooding of the reactor pit, and removal of the LWBR Core Holddown Barrel. Shipment preparations progressed to the receipt of the M-130-7 shipping container, its movement into the fuel handling building,

and its removal from the railcar. Preparations at ECF for receipt and storage of the spent fuel were nearly completed and training for these operations was begun.

2103 Power Reactors, Non-breeding, Graphite Moderated

REFER ALSO TO CITATION(S) 57164, 57175, 57341, 57344, 57422, 57514

57141 **(GA-A—17183) Interaction of fission products and SiC in TRISO fuel particles: a limiting HTGR design parameter.** Stansfield, O.M.; Homan, F.J.; Simon, W.A.; Turner, R.F. (GA Technologies, Inc., San Diego, CA (USA)). Sep 1983. Contract AT03-76ET35300. 9p. NTIS, PC A02/MF A01. Order Number DE84001009.

The fuel particle system for the steam cycle cogeneration HTGR being developed in the US consists of 20% enriched $UC_{0.3}O_{1.7}$ and ThO_2 kernels with TRISO coatings. The reaction of fission products with the SiC coating is the limiting thermochemical coating failure mechanism affecting performance. The attack of the SiC by palladium (Pd) is considered the controlling reaction with systems of either oxide or carbide fuels. The lanthanides, such as cerium, neodymium, and praseodymium, also attack SiC in carbide fuel particles. In reactor design, the time-temperature relationships at local points in the core are used to calculate the depth of SiC-Pd reaction. The depth of penetration into the SiC during service varies with core power density, power distribution, outlet gas temperature, and fuel residence time. These parameters are adjusted in specifying the core design to avoid SiC coating failure.

57142 **(IKE—2-60) Effect of temperature and fission product behavior on the reactivity of high temperature reactors.** Ploeger, G. (Stuttgart Univ. (Germany, F.R.). Inst. fuer Kernenergetik und Energiesysteme; Stuttgart Univ. (Germany, F.R.)). Mar 1983. 182p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751124.

Referring to the question for a possible recriticality of High Temperature Reactors under hypothetical accident conditions, the interaction of temperature, fission product and reactivity behaviour is investigated. First of all, to solve such problems, the basic methodical steps and the most important physical effects are explained by means of an example. To comment upon the reactivity behaviour universally as far as possible, also with regard to different design features, new models are presented describing the development of temperature and fission product behaviour. Their function is demonstrated by means of a pebble bed reactor under special initial and boundary conditions of accident. Having calculated the progress of the temperature and fission product densities their influence on the reactivity and the source terms of an attendant activity release are determined. Finally, the importance of the results is shown by comparison with the first example of application.

57143 **(Juel—1826) Numerical investigation of the 3-dimensional steady-state temperature- and flow distribution in the core of a pebble bed high temperature reactor.** Verfondern, K. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Jan 1983. 130p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751125.

This work presents a computer model determining the steady-state temperature- and flow field in 3 dimensions in the core of a pebble bed high temperature reactor. The numerical sprinkler method, basind on the Thermix-model, allows to describe the thermo-hydraulics of a non-rotational-symmetric core-geometry. The A√R-reactor in Juelich, in operation since 1967, represents a suitable investigation-object for the computer model of Thermix-3D. It is in a 3D-mesh-structure to reproduce very precisely the so called "graphite noses", in which the shut-down rods are conducted as well as the filling cones in the inner and outer area. The results of the final calculation of the normal operation condition for the AVR-reactor unambiguously show, that within the core reproduced in 3 dimensions there are evident deviations in the flow profile and in the temperatures of the cooling gas in contrast to a 2D-handling.

57144 **(Juel-Spez—187) Results of the critical experiments concerning OTTO loading at the critical HTR-test facility KAHTER.** Drueke, V.; Litzow, W.; Paul, N. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Dec 1982. 181p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751108.

Critical experiments concerning OTTO loading are described. In the KAHTER facility an OTTO loading has been simulated, therefore the original KAHTER assembly was reconstructed. The determination of critical masses and reactivity worths of control rods and of additional absorber rods in the top reflector and in the upper cavity was of main interest for comparison with reactor following calculations. Besides this, reaction rates in different energy regions were measured in the upper part of the core, in the cavity and top reflector.

57145 **(PNL-SA—10932) Relationships between strength, electrical conductivity, and density for oxidized PGX graphite.** Morgan, W.C.; Prince, J.M. (Pacific Northwest Lab., Richland, WA (USA)). Jul 1983. Contract AC06-76RL01830. 3p. (CONF-830711—5). NTIS, PC A02/MF A01. Order Number DE83016184.

From 16. American Carbon Society biennial conference; La Jolla, CA, USA (17 Jul 1983).

The core of a High Temperature Gas-Cooled Reactor (HTGR) rests on massive graphite core support blocks; which, in turn, are supported by core support posts. PGX graphite was used for the core support blocks of the Fort St. Vrain HTGR (the only operating HTGR); and, evidently, is the leading candidate material for use in advanced HTGRs. Therefore, PGX was chosen for the initial tests on the use of eddy current techniques to monitor strength changes as a result of oxidation. The results of these initial tests showed that both compressive strength and electrical conductivity correlated very well with density. However, only a single log of PGX was used for the initial tests; therefore, it was necessary to determine if the correlations could be extended to other logs of PGX.

2104 Power Reactors, Non-breeding, Otherwise Moderated Or Unmoderated

REFER ALSO TO CITATION(S) 57134, 57336

57146 (INIS-mf—8473, pp vp) **Advanced fuel cycles for CANDU. AECL's fuel development program.** Lane, A.D. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.:; Jeffs, A.T. (Atomic Energy of Canada Ltd., Ottawa, Ontario). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Thorium fuel cycles offer an evolutionary route to the reduction of uranium consumption in CANDU reactors, with the ultimate potential for self-sufficiency. The important facets of the fuel development program required to support such thorium fuel cycles are outlined with regard to fabrication technology and performance. In particular, the anticipated impact on individual process steps of having to remotely fabricate a highly \-active fuel are discussed as are the effects of these process steps on irradiation behaviour.

2105 Power Reactors, Breeding

REFER ALSO TO CITATION(S) 57134, 57174, 57177, 57179, 57186, 57453

57147 **(DOE/ET/37240—100-Rev.1) Coolant mixing in LMFBR rod bundles and outlet plenum mixing transients. Progress report, June 1, 1982-August 31, 1982.** Todreas, N.E. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Nuclear Engineering). Dec 1982. Contract AC02-76ET37240. 187p. NTIS, PC A09/MF A01. Order Number DE83010576.

Portions are illegible in microfiche products.

The first task (bundle geometry, wrapped and bare rods) is reported or, particularly the experimental bundle water mixing investigations and analytical model development. The bulk of the report is made up of a chapter on criteria for onset of flow recirculation in vertical rod bundles. (DLC)

57148 **(KFK—3335) German carbide program: Performance, experimental findings, and evaluation of irradiation results.** Steiner, H.; Freund, D.; Geithoff, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Sep 1982. 20p. (CONF-810803—36). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751122.

From Topical meeting on reactor safety aspects of fuel behavior; Sun Valley, ID, USA (2 Aug 1981).

In this report a synopsis of the German carbide program is presented. The program comprises the irradiation of about 100 carbide pins equipped with pelletted fuel. Most of these fuel pins were He-bonded, the sodium bonding concept taken as a back-up solution. The main design parameters such as smear and pellet density, gap size, pin diameter and wall thickness as well as the irradiation conditions were varied mostly within wide ranges. Based on a compilation of relevant pin parameters, irradiation conditions, and the results of various irradiation experiments conclusions on the optimum ranges of the main design parameters are drawn. Furthermore, some important aspects of fuel pin behaviour are discussed based on quantitative results from post irradiation examinations.

57149 **(KFK—3394) Fuel and fission product behaviour in mixed oxide pins under transient conditions.** Kleykamp, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Apr 1983. 29p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751153.

Pin sections of the subassemblies PNL-10 and PNL-11 irradiated in the EBR-II up to 5% burnup were exposed in the ACPR to transient irradiations of different severities. The initial composition of the high dense (91% th.d.) mixed oxide fuel was Usub(0.75)Pusub(0.25)Osub(1.97) with 65% U-235 of total uranium. The plutonium concentration at the central void of the pretransient sample was 28% PuO_2 in the position of 33 kW/m maximum linear heat rating. The fuel radius averaged xenon release gave fractions of 76% of the created xenon. Three pin sections have been submitted to power transients of which the severities have been controlled by different time intervals between the pulses. Partial fuel melting occurred. The short-time temperature excursion was not sufficient for uranium-plutonium redistributions. The xenon release increased from 76% up to 87% of the created xenon, though the volume swelling attained values up to 68%. The iodine release was the most sensitive one during the power transients, followed by xenon and oxidized molybdenum, and in lower proportions by barium and cesium. The concentration dependence on the fuel radius of these dissolved or submicroscopically precipitated fission products revealed complete release of xenon from the molten fuel whereas low concentrations of barium and cesium remained in the melt.

57150 **Experimental breeder reactor-II dynamic modeling and code verification.** Lehto, W.K.; Dean, E.M.; Koenig, J.F.; Larson, H.A. (Argonne National Laboratory, P.O. Box 2528, Idaho Falls, ID 83401). *Transactions of the American Nuclear Society;* **44**: 310-311(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57151 **Validation of ALICE-II code with SR1 complex vessel experiments SM-4 and SM-5.** Wang, C.Y.; Ku, J.L.; Zeuch, W.R. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 311-314(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57152 **Results of recent tests of the improved ACRR coded aperture imaging system.** Kelly, J.G.; Stalker, K.T. (Sandia National Laboratories, Albuquerque, NM (USA)). pp 571-580 of Actes de la conference de Lyon. Vol. 4 (Proceedings of the LMFBR safety topical meeting. Vol. 4). Paris, France; SFEN (1982). (CONF-820704—).

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

Experiments were conducted in the Annular Core Research Reactor (ACRR) to test the effectiveness of improvements in the Coded Aperture Imaging Fuel Motion detection System (CAIS). Additional shielding was added to the recording system, a bismuth layer was placed behind the test fuel pin to reduce scene background, and fine grain 35 mm films were used to record the coded images obtained of calibration fuel pins during steady state reactor operation. New coded apertures were also tested. The Uniformly Redundant Array (URA) was particularly successful. The demonstrated resolutions at the object plane are 1.70 mm radially and 9 mm axially (along the pin). This means that for LMFBR 20% enriched UO_2 fuel, the average mass in a resolution element is approximately 770 mg, and changes of 100 mg in a resolution element can be detected. The system is now able to record fuel motion in single pin, simulated accident tests with high precision.

2107 Regulation And Licensing

57153 **(UCID—19721) Technical-evaluation report on the tests conducted to verify the analyses performed on the adequacy of station electric distribution-system voltages for the Arkansas Nuclear One, Unit 1 (Docket No. 50-313).** Selan, J.C. (Lawrence Livermore National Lab., CA (USA)). 7 Oct 1983. Contract W-7405-ENG-48. 7p. NTIS, PC A02/MF A01. Order Number DE84001220.

This report supplements the technical evaluation documented in a separate report dated December 16, 1981 (UCID-19118) on the adequacy of station electric distribution system voltages for the Arkansas Nuclear One, Unit 1. The evaluation is to determine the adequacy of the tests conducted to verify the accuracy of the assumptions and system models used in the distribution system voltage analyses. The verification tests resulted in small percentage error differences which demonstrates the accuracy of the assumptions and system models used in the analytical voltage profiles.

2108 Economics

REFER ALSO TO CITATION(S) 57146

2109 Process Heat Reactors

REFER ALSO TO CITATION(S) 57344

22 NUCLEAR REACTOR TECHNOLOGY

57154 **(DOE/ER/75094—1) American Nuclear Society Western Regional Student Conference.** (California Univ., Santa Barbara (USA)). 1983. Contract FG02-83ER75094. 36p. (CONF-830393—Absts.). NTIS, PC A03/MF A01. Order Number DE84001385.

From ANS western regional student conference; Santa Barbara, CA, USA (25 Mar 1983).

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Abstracts are presented for the conference. Session topics include: radiation measurements and health physics, nuclear materials and radiation damage, fission reactor technology, fusion reactor technology, fuel management, and thermalhydraulics. (GHT)

2201 Theory And Calculation

57155 (KURRI-TR—203) Report of the study meeting on statistical phenomena in reactors. Nishihara, H.; Kishida, K.; Morishima, N.; Kimura, Y. (eds.). (Kyoto Univ., Kumatori, Osaka (Japan). Research Reactor Inst.). 1980. 105p. (CONF-800195—). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781084.

From Meeting on statistical phenomena in reactors; Kumatori, Japan (21 Jan 1980).

Separate abstracts are presented for each of the papers included in the data base.

57156 Flux and power map generation through parameter estimation. Bryson, J.W.; Lee, J.C. (Sandia National Laboratories, P.O. Box 5800, Albuquerque, NM 87185). *Transactions of the American Nuclear Society;* **44**: 264-265(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57157 Nodal method storage reduction by nonlinear iteration. Smith, K.S. (Argonne National Laboratory, P.O. Box 2528, Idaho Falls, ID 83401). *Transactions of the American Nuclear Society;* **44**: 265-266(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57158 Impact of vector processors on computational physics. Taggart, K.A. (Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* **44**: 268-269(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57159 Vectorization of conditional computation. McMahon, F. (Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **44**: 269-270(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57160 Benchmark solutions for the infinite critical cylinder. Westfall, R.M. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 281-283(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2202 Components And Accessories

REFER ALSO TO CITATION(S) 57291

57161 Statistical analysis of pressure vessel steel embrittlement data. Berggren, R.G.; Stallman, F.W. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 225-227(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2203 Fuel Elements

57162 (NUREG/CR—2507) Background and derivation of ANS-5.4 Standard fission-product-release model. (Southern Science Applications, Inc., Dunedin, FL (USA); American Nuclear Society, La Grange Park, IL). Jan 1982. 160p. NTIS MF A01 - GPO $6.50. Order Number DE84900127.

Microfiche only, copy does not permit paper copy reproduction.

This report summarizes work performed by the ANS-5.4 Working Group on Fuel-Plenum Fission Gas Inventory and is a compilation of individual contributions by members of the Working Group. The report was compiled to document the basis for the ANSI/ANS Standard on Method for Calculating the Fractional Release of Volatile Fission Products from Oxide Fuels, ANSI/ANS 5.4-1981. The information contained in this report is important to an understanding of the Standard, and has been reviewed and approved by the Working Group.

2204 Control Systems

57163 (GKSS—83/E/4) Tr desorption from a spent BWR B_4C control element. Gidarakos, E. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1983. 22p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751159.

In this paper we describe the test of a method for the desorption of tritium from irradiated B_4C-absorber rods. The release of tritium is performed by heating the B_4C to 600 - 1100°C. The amount of the released tritium was determined quantitatively using chemical reactions. This was achieved by oxidation to HTO or T_2O. The tritium activity was determined using a liquid-scintillation-counter.

57164 (Juel—1750) User's manual for ASTERIX-2: A two-dimensional modular code system for the steady state and xenon transient analysis of a pebble bed high temperature reactor. Wu, T.; Cowan, C.L.; Lauer, A.; Schwiegk, H.J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Mar 1982. 203p. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751106.

Prepared in part for the U.S. Department of Energy.

The ASTERIX modular code package was developed at KFA Laboratory-Juelich for the steady state and xenon transient analysis of a pebble bed high temperature reactor. The code package was implemented on the Stanford Linear Accelerator Center Computer in August, 1980, and a user's manual for the current version of the code, identified as ASTERIX-2, was prepared as a cooperative effort by KFA Laboratory and GE-ARSD. The material in the manual includes the requirements for accessing the program, a description of the major subroutines, a listing of the input options, and a listing of the input data for a sample problem. The material is provided in sufficient detail for the user to carry out a wide range of analysis from steady state operations to the xenon induced power transients in which the local xenon, temperature, buckling and control feedback effects have been incorporated in the problem solution.

2205 Environmental Aspects

REFER ALSO TO CITATION(S) 57139, 57607

57165 Formation and transport of fission product aerosols. Im, K.H.; Ahluwalia, R.K. (Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439). *Transactions of the American Nuclear Society;* **44**: 70(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2206 Research, Test, And Experimental Reactors

REFER ALSO TO CITATION(S) 57181

57166 (PNL-TR—433) Experimental conditions in Osiris with the new caramel-type fuel. Beylot, J. (Pacific Northwest Lab., Richland, WA (USA); CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). Oct 1983. Contract AC06-76RL01830. Translation of CEA-CONF—4736. 17p. NTIS, PC A02/MF A01. Order Number DE84001195.

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The replacement of the old highly enriched (93%) UAl fuel by the low-enrichment oxide (7%) leads to some variations in the experimental conditions for irradiations. These changes are summarized.

57167 **(PNL-tr—434) Replacement of highly enriched uranium in the fuel of research piles by low- or medium-enrichment uranium.** Schwarz, J.P. (Pacific Northwest Lab., Richland, WA (USA); International Atomic Energy Agency, Vienna (Austria)). Oct 1983. Contract AC06-76RL01830. Translation of INFCE/DEP./WG.8/14, communication to the IAEA, Vienna, May 1978. 10p. NTIS, PC A02/MF A01. Order Number DE84001196.

The change to lower enrichment UA1 fuel assemblies or to Zircaloy-clad UO_2 fuel assemblies is discussed. The reasons which led to the use of uranium with 93% U-235 enrichment are still valid: to achieve the best compromise between reactivity balance and performances. The use of lower-enrichment uranium thus corresponds to a limitation which is accepted more or less satisfactorily depending on the case. The costs of change are greater the higher the performances of the reactor and the poorer the possibilities of adapting the reactor if it already exists. Such a change remains feasible for less ambitious projects.

57168 **Test reactor physics effects on fuel motion diagnostic data interpretation.** Lumpkin, A.H.; Berzins, G.J. (Los Alamos National Laboratory, NM (USA)). pp 641-650 of Actes de la conference de Lyon. Vol. 4 (Proceedings of the LMFBR safety topical meeting. Vol. 4). Paris, France; SFEN (1982). (CONF-820704—).

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

Time-dependent core physics effects in the Transient Reactor Test Facility (TREAT) are shown to interfere with the interpretation of fuel motion diagnostic data. In particular, data from a "constant power" test indicate large (> 15%) test pin signal changes relative to the reactor instrumentation readings. This effect is attributed mainly to transient control rod relocations.

2207 Plutonium And Isotope Production Reactors

57169 **(DPST—82-1085) New Production Reactor project-management plan.** McCrosson, F.J.; Hibbard, L.; Buckner, M.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 22 Dec 1982. Contract AC09-76SR00001. 137p. NTIS, PC A07/MF A01. Order Number DE84001013.

This document provides a project management plan for the first phase of a project to design and build a new production reactor (NPR) at SRP. The design of the NPR is based upon proven SRP heavy water reactor design, with several enhancements such as full containment, moderator detritiation, improved cooling, and modernized control rooms and instrumentation. The first phase of the NPR project includes environmental and safety analyses, preparation of the technical data summary and basic data, site studies, engineering studies, and conceptual design. The project management plan was developed by a 14-member task force comprised of representatives from the Technical Division, the Manufacturing Division, the Departmental Engineer's Office, and the Engineering Department.

57170 **Application of ^{252}Cf-source-driven noise analysis measurements for subcriticality of HFIR fuel elements.** King, W.T.; Mihalczo, J.T. (Oak Ridge National Laboratory, Oak Ridge, TN 37830). *Transactions of the American Nuclear Society;* **44**: 290-291(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

2208 Propulsion Reactors

57171 **(ESG-DOE—13408) Space reactor system and subsystem investigations: assessment of technology issues for the reactor and shield subsystem, SP-100 Program.** Atkins, D.F.; Lillie, A.F. (Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group). 30 Jun 1983. Contract AT03-82SF11687. 37p. NTIS, PC A03/MF A01. Order Number DE84001566.

As part of Rockwell's effort on the SP-100 Program, preliminary assessment has been completed of current nuclear technology as it relates to candidate reactor/shield subsystems for the SP-100 Program. The scope of the assessment was confined to the nuclear package (to the reactor and shield subsystems). The nine generic reactor subsystems presented in Rockwell's Subsystem Technology Assessment Report, ESG-DOE-13398, were addressed for the assessment.

2209 Reactor Safety

REFER ALSO TO CITATION(S) 56991, 56992, 57451, 57518, 57708

57172 **(EGG-M—17682) Cladding axial elongation models for FRAP-T6.** Shah, V.N.; Carlson, E.R.; Berna, G.A. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 11p. (CONF-830805—59). NTIS, PC A02/MF A01. Order Number DE84001049.

From 7. international conference on structural mechanics in reactor technology; Chicago, IL, USA (22 Aug 1983).

This paper presents a description of the cladding axial elongation models developed at the Idaho National Engineering Laboratory (INEL) for use by the FRAP-T6 computer code in analyzing the response of fuel rods during reactor transients in light water reactors (LWR). The FRAP-T6 code contains models (FRACAS-II subcode) that analyze the structural response of a fuel rod including pellet-cladding-mechanical-interaction (PCMI). Recently, four models were incorporated into FRACAS-II to calculate cladding axial deformation: (a) axial PCMI, (b) trapped fuel stack, (c) fuel relocation, and (d) effective fuel thermal expansion. Comparisons of cladding axial elongation measurements from two experiments with the corresponding FRAP-T6 calculations are presented.

57173 **(GKSS—83/E/5) Multivent test programme - calculation of the basic experiments using the code CORAN.** Schwan, H.; Hassan, M.A. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1983. 32p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751139.

With 14 figs., 9 tabs.

Analytical predictions of the code CORAN for the thermodynamic response of the GKSS-Multivent-Test-Facility in a number of blowdown experiments are presented. The calculated data agree well to the corresponding measured ones. Due to lack of detailed simulation models some deviations from the measurements are obvious. Modelling of these details has been assumed to be negligable during evaluation of the code.

57174 **(GKSS—83/E/7) Experiment for simulating the response of core internal structures in the expansion volume to loads occurring during pressure suppression.** Deeg, H.J. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1983. 24p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751086.

With 13 figs. and 1 tab.

During the transition phase of a hypothetical loss of flow accident without scram in LMFBRs the occurence of a closed boiling steel/fuel mixture inside the reactor core is assumed (so-called boiling pool). The model development and analytical treatment assume a pressure rise and melting of the crust surrounding the mixture in the course of further accident scenario. These both events will lead to a pressure suppression in connection with material transport. During this expansion process thermal energy is partially transformed to mechanical energy which leads to structure loads in the expansion volume. In order to investigate the above-mentioned phenomena simulation experiments were carried out at GKSS-Forschungszentrum Geesthacht. Preliminary results of these experiments are discussed.

57175 **(Juel-Spez—136/Bd.6) Safety study HTR conceptual designs under German siting conditions. Phase I B, Appendix V.** (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Nukleare Sicherheitsforschung; Gesellschaft fuer Reaktorsicherheit m.b.H. (GRS), Koeln (Germany, F.R.)). Jan 1983. 123p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751263.

The drafted main volume was submitted for review comment to other organizations also concerned with HTRs; most of the criticism advanced could still be taken into account in the final version. General Atomic Comp. assessed the radiological consequences and risk with models of their own and found good agreement with AIPA values. Weak points in the system design of the HTR-1160 plant were identified in the main study, leading to certain unrealistically high risk contributions. Improvements are being proposed in the supplementary studies reported here, which may be justified from a technical point of view and probably would have been called for or taken into account anyway in the further pursuance of the project. The influence on release frequencies and, thus, on risk contributions is assessed by consideration of the modified design in existing fault trees. In this connection it was found that the frequency of core heatup can be totally reduced by a factor of 5. It is even more important to note that the frequency of event sequences involving a failure of the reactor containment and massive environmental releases even decreases by one to two orders of magnitude. Water-ingress accidents become almost insignificant for the risk.

57176 **(KFK—3346) LWR fuel rod behavior in the FR2 in-pile tests simulating the heatup phase of a LOCA.** Karb, E.H.; Pruessmann, M.; Sepold, L.; Hofmann, P.; Schanz, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Ingenieurtechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Mar 1983. 110p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751087.

This is the final report on the results of the FR2 In-pile Experiments on LWR (Light Water Reactor) fuel rod behavior. The tests were to investigate the possible influence of a nuclear environment on fuel rod failure mechanisms. Unirradiated and irradiated (2500 to 35,000 MWd/tsub(u)) PWR-type test fuel rods as well as electrically heated fuel rod simulators were exposed to temperature transients simulating the second heatup phase of a LOCA (Loss-of-Coolant Accident). Rod internal overpressure combined with elevated cladding temperatures caused the rod claddings to balloon and rupture. The burst data (burst temperature, burst pressure, and burst strain) of the nuclear test rods did not indicate differences from results obtained with electrically heated fuel rod simulators, and did not show an influence of burnup. The fuel pellets in previously irradiated rods, already cracked during normal reactor operation, fragmented after having lost their radial support by the cladding when this deformed radially. In the ballooned region the fuel particle dislocation usually led to a complete loss of pellet shape. Consequently, fuel particle movement into the ballooned region from sections above resulted in significant reductions of the pellet stack height. The fuel pellet fragmentation and the particle dislocation, however, did not affect the cladding deformation process during the relatively fast transients investigated in this program.

57177 **(KFK—3366) Critical review of the literature on high energy release during hypothetical core disruptive accidents in sodium-cooled fast breeder reactors.** Fischer, E.A.; Froehlich, R.; Heusener, G.; Jacobs, H.; Maschek, W.; Royl, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Mar 1983. 227p. (In German). NTIS (US Sales Only), PC A11/MF A01. Order Number DE83751167.

Upon the request of the "Enquete-Kommission" on Future Nuclear Energy Policy set up by the German Federal Parliament, a literature survey has been compiled on all scientific studies of Bethe-Tait accidents with high potentials of mechanical energy releases ("Literaturuebersicht zu allen wissenschaftlichen Arbeiten ueber Bethe-Tait-Stoerfaelle mit hohem mechanischem Energiefreisetzungspotential"). The study is a critical review of all relevant scientific publications and studies by the international scientific community in this field, which are devoted to high mechanical energy releases from major accidents in sodium cooled fast breeder reactors, or at least indicate the potential for high energy releases. These publications are evaluated with respect to their relevance to the design base levels of the SNR 300. In accordance with the wishes expressed by the "Enquete-Kommission", the study not only deals with the arguments and findings by scientists from national research centers and from the fast breeder development association, but also takes into account the arguments and findings by working groups in Germany and abroad, which represent different attitudes vis-a-vis the utilization of nuclear power and the fast breeder reactor. The study was handed over to the "Enquete-Kommission" in 1982. The present version differs in some minor points from the original version. The conclusion to be drawn from the examination of the bulk of the above mentioned information is this: - For the SNR 300 the occurence of major accidents with mechanical energy releases exceeding the design limit of 370 MWs can be excluded with a probability verging on certainty, i.e., to all practical intents and purposes.

57178 **(KFK—3373) Accident consequence calculations and risk assessments for pressurized light water reactors with the computer code UFOMOD/B3.** Ehrhardt, J.; Vogt, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). May 1983. 87p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751151.

With respect to the application of the accident consequence model of the German Risk Study (GRS) for light water reactors to risk assessments of other reactor types (high temperature reactor HTR-1160, fast breeder reactor SNR-300), the improved version UFOMOD/B3 was developed. The modifications mainly concern the deposition parameters, the resuspension process, the ingestion model and the dose factors. To make results comparable, recalculations for pressurized light water reactors were performed with the release categories of the GRS. The results show in contrast to the findings of the GRS a significant reduction of the acute fatality risk by a factor of 3.6. This essentially results from the smaller deposition parameters. The latent fatality risk was calculated nearly unchanged.

57179 **(KFK—3476) Analysis of an autocatalytic reactivity effect by reduction of neutron streaming in a fuel/steel pool.** Maschek, W.; Fischer, E.A.; Heger, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik). May 1983. 35p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751169.

If a hypothetical core disruptive accident in an LMFBR leads to boiling fuel/steel mixtures in the transitory phase or phase of integral material motion a superpromt critical nuclear power excursion (secondary excursion) could trigger a steel vapor bubble collapse. This is because of an insufficient mass flow of evaporating material into these vapor bubbles to generate a sufficiently high internal vapor pressure while new smaller vapor bubbles are generated in the bulk fluid. The collapsing of the larger bubbles reduces the neutron streaming from the pool while the new smaller bubbles cannot balance this effect. This effect has the potential to initiate an autocatalytic process with fast positive reactivity addition. The present work analyses the increase in accident energetics for energetic secondary excursions.

57180 **(KFK—3546) Reliability study for the containment of a pressurized water reactor using probabilistic fracture mechanics. Pt. 2.** Haeberer, R.; Brueckner, A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorbauelemente). May 1983. 65p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751152.

A reliability analysis is performed by the methods of probabilistic fracture mechanics for the steel containment of a PWR during a loss of coolant accident. Earlier studies showed, that the failure probability is very small, but due to the existing uncertainties it is impossible to give absolute numbers. The effect of these uncertainties is examined in a sensitivity study. It is shown that the calculated failure probability strongly depends on the fracture mechani-

cal model chosen to describe the real embedded cracks. The distribution of fracture toughness is another uncertainty factor since only few measured values were available. Changes in the distribution functions of all other quantities of interest don't influence the calculated failure probability within the accuracy of the calculation.

57181 **(NUREG—0996) Safety evaluation report related to the renewal of the operating license for the University of Oklahoma Research Reactor (Docket No. 50-112).** (Nuclear Regulatory Commission, Washington, DC (USA). Office of Nuclear Reactor Regulation). Sep 1983. 59p. NTIS, PC A04/MF A01 - GPO $4.50. Order Number DE84900095.

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This Safety Evaluation Report for the application filed by the University of Oklahoma for a renewal of Operating License R-53 to continue to operate a research reactor has been prepared by the Office of Nuclear Reactor Regulation of the US Nuclear Regulatory Commission. The facility is owned and operated by the University of Oklahoma and is located on the campus in Norman, Cleveland County, Oklahoma. The staff concludes that the Aerojet General Nucleonics (AGN) reactor facility can continue to be operated by University of Oklahoma without endangering the health and safety of the public.

57182 **(NUREG/CR—1278) Handbook of human-reliability analysis with emphasis on nuclear power plant applications. Final report.** Swain, A.D.; Guttmann, H.E. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1983. Contract AC04-76DP00789. 699p. (SAND—80-0200). NTIS, PC A99/MF A01 - GPO. Order Number DE84001077.

The primary purpose of the Handbook is to present methods, models, and estimated human error probabilities (HEPs) to enable qualified analysts to make quantitative or qualitative assessments of occurrences of human errors in nuclear power plants (NPPs) that affect the availability or operational reliability of engineered safety features and components. The Handbook is intended to provide much of the modeling and information necessary for the performance of human reliability analysis (HRA) as a part of probabilistic risk assessment (PRA) of NPPs. Although not a design guide, a second purpose of the Handbook is to enable the user to recognize error-likely equipment design, plant policies and practices, written procedures, and other human factors problems so that improvements can be considered. The Handbook provides the methodology to identify and quantify the potential for human error in NPP tasks.

57183 **(NUREG/CR—2575-R2) BWR Full Integral Simulation Test (FIST) Program test plan.** Thompson, J.E. (General Electric Co., San Jose, CA (USA). Nuclear Energy Div.). Sep 1983. 38p. (EPRI-NP—2313-R2; GEAP—22053-R2). NTIS, PC A03/MF A01 - GPO $3.75. Order Number DE84900243.

A test plan for the BWR Full Integral Simulation Test (FIST) Program is presented. The test program will investigate BWR thermal-hydraulic response under LOCA and operational transient conditions in a scaled BWR-6/218 test apparatus. In this document, test parameters are selected, individual tests are defined, and measurement and data-utilization plans are presented.

57184 **(NUREG/CR—3050) Closeout of IE Bulletin 81-02 and supplement: failure of gate-type valves to close against differential pressure.** Foley, W.J.; Hennick, A. (Parameter, Inc., Elm Grove, WI (USA)). Sep 1983. 53p. NTIS, PC A04/MF A01 - GPO $4.50. Order Number DE84900085.

In NUREG-0737 of October 31, 1980, NRC formally provided the utilities with a proposed program for full-scale qualification testing of gate-type power-operated relief valve (PORV) block valves. Test results for the first seven valves tested by Electric Power Research Institute (EPRI) indicated that certain models of Westinghouse and Borg-Warner 3-inch valves failed to close completely. Later, Westinghouse reported that its entire line of motor-operated gate valves had this potential deficiency. In order to bring this potential problem to the attention of licensees and permit holders and to assure completion of any necessary corrective actions in safety-related systems, the NRC issued IE Bulletin 81-02 on April 9, 1981 and the Supplement covering additional Westinghouse valves on August 18, 1981. Utility responses for 130 facilities with operating licenses, construction permits or licenses for low power testing have been evaluated. Both the Bulletin and Supplement have been closed out for 110 of the 130 current facilities. Followup items are proposed for 20 facilities not closed out and for 23 closed-out facilities for which followup of corrective action will be tracked by the Regions as 10 CFR 50.55(e) or 10 CFR Part 21 items. Investigation of fracture of Limitorque operator housings of modified Westinghouse gate valves at Oconee 2 and Watts Bar 1 and 2 is recommended.

57185 **(NUREG/CR—3330) Vulnerability of nuclear power plant structures to large external fires.** Bennett, D.E. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1983. Contract AC04-76DP00789. 44p. (SAND—83-1178). NTIS, PC A03/MF A01 - GPO. Order Number DE84001185.

This report examines the inherent vulnerability of nuclear power plant structures to the thermal environments arising from large, external fires. The inherent vulnerability is the capacity of the concrete safety-related structures to absorb thermal loads without exceeding the appropriate thermal and structural design criteria. The potential sources of these thermal environments are large, offsite fires arising from accidents involving the transportation or storage of large quantities of flammable gases or liquids. A realistic thermal response analysis of a concrete panel was performed using three limiting criteria: temperature at the first rebar location, erosion and ablation of the front (exterior) surface due to high heat fluxes, and temperature at the back (interior) surface. The results of this analysis yield a relationship between incident heat flux and the maximum allowable exposure duration. Example calculations for the break of a 0.91 m (3') diameter high-pressure natural gas pipeline and a 1 m^2 hole in a 2-1/2 million gallon gasoline tank show that the resulting fires do not pose a significant hazard for ranges of 500 m or greater.

57186 **(NUREG/CR—3401-R7) Laboratory-scale sodium-carbonate aggregate concrete interactions.** Westrich, H.R.; Stockman, H.W.; Suo-Anttila, A. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 65p. (SAND—83-1502-R7). NTIS, PC A04/MF A01 - GPO. Order Number DE84000884.

A series of laboratory-scale experiments was made at 600°C to identify the important heat-producing chemical reactions between sodium and carbonate aggregate concretes. Reactions between sodium and carbonate aggregate were found to be responsible for the bulk of heat production in sodium-concrete tests. Exothermic reactions were initiated at 580+-30°C for limestone and dolostone aggregates as well as for hydrated limestone concrete, and at 540+-10°C for dehydrated limestone concrete, but were ill-defined for dolostone concrete. Major reaction products included CaO, MgO, Na_2CO_3, Na_2O, NaOH, and elemental carbon. Sodium hydroxide, which forms when water is released from cement phases, causes slow erosion of the concrete with little heat production. The time-temperature profiles of these experiments have been modeled with a simplified version of the SLAM computer code, which has allowed derivation of chemical reaction rate coefficients.

57187 **(NUREG/CR—3421) Cost/benefit analysis of adding a feed-and-bleed capability to Combustion Engineering pressurized-water reactors.** Gallup, D.R.; Gahan, E.; Cherdack, R.; Skala, G. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1983. Contract AC04-76DP00789. 164p. (SAND—83-1629). NTIS, PC A08/MF A01 - GPO. Order Number DE84001183.

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This report presents the results of a cost/benefit analysis for the addition of a feed-and-bleed capability to the San Onofre Nuclear Generating Station, Unit 2, (SONGS 2). Two cases of feed-and-bleed capability were investigated: 1) adding power-operated relief valves (PORVs) to the pressurizer for depressurization and using the present high-pressure safety-injection (HPSI) system for reactor-coolant-system (RCS) inventory make-up and 2) adding an independent single-train feed-and-bleed system. For the first case, it is estimated that the core-melt frequency would be incrementally reduced by 4.0E-6 per year, a factor of 1.3, at a cost of $2.5 M to

$4.3 M depending on when the equipment is installed. For the second case, it is estimated that the core-melt frequency would be incrementally reduced by 1.2E-5 per year, a factor of 3, at a cost of $7.0 M to $10.3 M.

57188 **(NUREG/CR—3462) Experiment data report for Semiscale Mod-2B Power-Loss Test Series (Tests S-PL-4 and -7).** Larson, R.A. (EG and G Idaho, Inc., Idaho Falls (USA)). Sep 1983. Contract AC07-76ID01570. 53p. (EGG—2274). NTIS, PC E04/MF A01 - GPO. Order Number DE84001521.

Includes 4 sheets of 48x reduction microfiche.

This report presents test data recorded for Tests S-PL-4 and -7 of the Semiscale Mod-2B Power Loss (PL) Experiment Test Series. These tests are part of a series of Semiscale tests that investigate the thermal-hydraulic phenomena resulting from a hypothesized loss-of-coolant accident (LOCA) or abnormal operating transient. These tests provide experimental data for assessing the analytical capability of computer codes used in LOCA and operational transient analysis. Test S-PL-4 simulated a loss-of-offsite power transient resulting from a 5% break in the pump suction of the primary coolant loop. Test S-PL-7 was a simulated loss-of-offsite power transient coupled with an assumed failure of the reactor to achieve scram. This report presents the uninterpreted data from Tests S-PL-4 and -7 for analysis. The data, presented as graphs in engineering units, have been analyzed only to the extent necessary to ensure that they are reasonable and consistent.

57189 **(ORAU/IEA—83-2(M)-Rev.) Towards intrinsically safe light-water reactors.** Hannerz, K. (Oak Ridge Associated Universities, Inc., TN (USA); ASEA-ATOM AB, Vaesteraas (Sweden)). Jul 1983. Contract AC05-76OR00033. 97p. NTIS, PC A05/MF A01. Order Number DE83017859.

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Most of the present impediments to the rational use of the nuclear option have their roots in the reactor safety issue. The approach taken to satisfy the escalating safety concerns has resulted in excessively complex and expensive plant designs but has failed to create public confidence. This paper describes a new approach based on the principle of Process Inherent Ultimate Safety (PIUS). With the PIUS principle, ultimate safety is obtained by guaranteeing core integrity under all credible conditions. This is accomplished on the basis of the laws of gravity and thermohydraulics alone, interacting with the heat extraction process in an intact or damaged primary circuit, without recourse to engineered safety systems that may fail or dependence on error-prone human intervention. Application of the PIUS principle to the pressurized water reactor involves a substantial redesign of the reactor and primary system but builds on established PWR technology where long-term operation is needed for verification.

57190 **(UCRL—53050) Seismic qualification of PWR plant auxiliary feedwater systems.** Lu, S.C.; Tsai, N.C. (Lawrence Livermore National Lab., CA (USA)). Aug 1983. Contract W-7405-ENG-48. 153p. NTIS, PC A08/MF A01. Order Number DE84001425.

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The NRC Standard Review Plan specifies that the auxiliary feedwater (AFW) system of a pressurized water reactor (PWR) is a safeguard system that functions in the event of a Safe Shutdown Earthquake (SSE) to remove the decay heat via the steam generator. Only recently licensed PWR plants have an AFW system designed to the current Standard Review Plan specifications. The NRC devised the Multiplant Action Plan C-14 in order to make a survey of the seismic capability of the AFW systems of operating PWR plants. The purpose of this survey is to enable the NRC to make decisions regarding the need of requiring the licensees to upgrade the AFW systems to an SSE level of seismic capability. To implement the first phase of the C-14 plan, the NRC issued a Generic Letter (GL) 81-14 to all operating PWR licensees requesting information on the seismic capability of their AFW systems. This report summarizes Lawrence Livermore National Laboratory's efforts to assist the NRC in evaluating the status of seismic qualification of the AFW systems in 40 PWR plants, by reviewing the licensees' responses to GL 81-14.

57191 **Reactor accidents: a global reassessment of consequences.** Moore, T.; Rahn, F.J.; Vogel, R. *EPRI (Electric Power Research Institute) Journal;* **8**: No. 6, 16-23(Jul-Aug 1983).

Elements of risk in reactor accidents are discussed. Estimates of the public risk from nuclear-power-plant accidents hinge on three important factors: (1) the probability of specific events occurring that could lead to an accident involving radiation release; (2) the quantity, type, and timing of release of radioactive material that would escape the reactor-containment building if it is breached; and (3) the effect of actions, such as evacuation, to mitigate the consequences of the accident to the public.

57192 **Assessment of criticality safety in DOE facilities.** Lloyd, R.C.; Clayton, E.D. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 297-299(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57193 **A probabilistic criticality analysis of the transfer of fissile material in the LLNL plutonium building.** Koponen, B.L.; Barnett, C.S. (Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **44**: 300-301(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57194 **Criticality safety training at the hot fuel examination facility.** Garcia, A.S.; Courtney, J.C.; Thelen, V.N. (Argonne National Laboratory, P.O. Box 2528, Idaho Falls, ID 83401). *Transactions of the American Nuclear Society;* **44**: 305-306(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57195 **Criticality safety training at the Lawrence Livermore National Laboratory.** Lowry, L.L. (Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550). *Transactions of the American Nuclear Society;* **44**: 309(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57196 **Human factors in the control room-organizational behavior and small group processes.** O'Brien, J.N.; Rosa, E.A.; Stengrevics, J.M. (Brookhaven National Laboratory, Upton, NY 11973). *Transactions of the American Nuclear Society;* **44**: 162-163(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57197 **Human error identification and analysis implicitly determined from LERs.** Luckas, W.J. Jr.; Speaker, D.M. (Brookhaven National Laboratory, Upton, NY 11973). *Transactions of the American Nuclear Society;* **44**: 175-176(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57198 **A program plan for future regulatory activity in nuclear power plant maintenance.** Badalamente, R.V. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 176-179(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57199 **Developing criteria for risk assessment of nonreactor nuclear facilities.** Denovan, J.T.; Lucas, D.E. (Battelle-Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352). *Transactions of the American Nuclear Society;* **44**: 295-297(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

57200 **NRC activities for maintaining exposures ALARA.** Congel, F.J. pp D77-D90 of Radiation issues for the nuclear industry. Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). (CONF-821077—).

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

The author traces the history of ALARA (as low as reasonably achievable) activities in the occupational dose area, gives the ALARA rule's current status, and tells how it is intended to be implemented. Requirements added as a result of the Three Mile Island accident are discussed, and the terms transient worker and temporary worker are defined for data collection purposes. 7 figures, 2 tables.

57201 **(WH-Trans—567) Safety of nuclear plants. Extract from report of nuclear engineering symposium, Mannheim 1982.** Translated from *ATW, Atomwirtschaft, Atomtechnik ;* **27**: No. 8-9, 456-457(1982). 3p. NTIS (US Sales Only), MF A01. Order Number DE83903084.

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Presentation of reports on the safety of nuclear plants was also in 1982 the centre of interest at the Symposium. 28 specialist papers and 15 contributions to the poster session reported on analytical and experimental results on the safety of light water and high temperature reactors, as well as of reprocessing plants. Great attention was aroused by one specialist session which, with four papers and a platform discussion, concerned itself with Possibilities and Effects of Severe Reactor Accidents.

25 ENERGY STORAGE

REFER ALSO TO CITATION(S) 56996, 56997, 56998

2506 Thermal

REFER ALSO TO CITATION(S) 57088

57202 **(AD-A—130356/9) Thermal energy storage evaluation and life testing. Interim report May-Oct 81.** Richter, R. (Jet Propulsion Lab., Pasadena, CA (USA)). Jan 1983. 44p. NTIS, PC A03/MF A01.

Two thermal energy storage (TES) units which were built under a previous contract were tested with a Hi-Cap Vuilleumier cryogenic cooler in the facility of the Hughes Aircraft Corporation. The objective of the program was the evaluation of the behavior of the TES units as well as the determination of the temperature history of the three cold stages of the Vuilleumier cryogenic cooler during cyclic charging and discharging of the TES units. The test results have confirmed that thermal energy storage can provide the necessary thermal power to the hot cylinders of the Vuilleumier cryogenic cooler at the required operating temperatures. Thereby the continuous cooling capability of the cooler during an eclipse when no electrical power is available is being assured. The cold stage temperature amplitudes during a complete charge - discharge cycle of the TES units were only about 10% of the amplitudes which were observed when the Hi-Cap Vuilleumier cryogenic cooler was operating without thermal energy storage backup in a simulated orbit of 54 minutes sun exposure and 18 minutes eclipse time. The themal conductivity of the molten thermal energy storage salt was apparently only a fraction of the thermal conductivity which had been assumed for the prediction of the upper heater temperatures. A redesign of the heater temperatures below 1480 degrees F which is now required for full charging of the TES units within 54 minutes with the present heater design.

57203 **(DOE/ET/26963—T3) Techno-socio-economics of distributed thermal-energy storage as a part of load management.** Cambel, A.B.; Georgiou, G.C.; Koenig, E.F.; Margolin, J.B.; Kahan, C.V.; Loew, M.H. (George Washington Univ., Washington, DC (USA). Office of Energy Programs). Sep 1982. Contract AC01-78ET26963. 15p. NTIS, PC A02/MF A01. Order Number DE83018204.

A variety of activities is being conducted in the general area of thermal energy storage on the customer side of the meter. The following four Tasks are reported: (1) Techno-Economic Modelling of Distributed Thermal Energy Storage Systems; (2) Storage Bibliography; (3) Monthly Storage Review; and (4) Special Tasks.

57204 **(LBL—14984) Control of the movement of a fluid plume by injection and production procedures.** Doughty, C.; Tsang, C.F. (Lawrence Berkeley Lab., CA (USA)). Mar 1983. Contract AC03-76SF00098. 9p. (CONF-830301—20). NTIS, PC A02/MF A01. Order Number DE84001045.

From ASME-JSME thermal engineering joint conference; Honolulu, HI, USA (20 Mar 1983).

In order to study control of the shape and movement of a fluid plume in a confined aquifer, the effects of various injection and production procedures on the extraction of an axisymmetric hot water plume have been calculated with a numerical model. These studies show that the effects of buoyancy flow and aquifer heterogeneity can be counteracted during extraction. The numerical techniques have been verified against an Aquifer Thermal Energy Storage field experiment conducted by Auburn University on a shallow aquifer in Mobile County, Alabama. The results of this study can be applied to fluid plumes of chemical and physical properties different from the native groundwater.

57205 **(NYSERDA—82-20) Aquifer storage of winter chill at Stony Brook State University.** (New York State Energy Research and Development Authority, Albany (USA)). Mar 1983. Contract AC06-76RL01830. 53p. NTIS, PC A04/MF A01. Order Number DE84001432.

The primary focus of the work presented is on the economic feasibility of developing a chill aquifer thermal energy storage (ATES) system at Stony Brook, NY. The fundamental concept of the project is to inject chilled water into the aquifer and recover the cold water in summer for use in an air conditioning system. The aquifer system on Long Island and the aquifer characteristics underlying Stony Brook are described, including the unusual reverse thermal gradient in the upper 400 feet of sediments at Stony Brook. Two options for development of ATES at Stony Brook are studied: a two-building option and a central plant option. A field experiment to define hydraulic and thermal reaction of the aquifer to the injection of chill is reported. (LEW)

57206 **(ORNL/Sub—81-9063/1) Unfired olivine heat storage media.** Whittemore, O.J. (Washington Univ., Seattle (USA). Dept. of Mining and Metallurgical and Ceramic Engineering). Oct 1983. Contract W-7405-ENG-26. 18p. NTIS, PC A02/MF A01. Order Number DE84001528.

An olivine heat storage brick which does not require firing has been developed. The brick aggregate consists of crushed olivine from Washington State and a phosphate compound as a binder. Brick bulk densities of 2.80 g/cm^3 were measured and found to be slightly superior to those found in existing fired olivine refractories. The recipe for fabrication and results of thermophysical property measurements for the unfired brick are presented.

57207 **(PB—83-239913) Borehole heat store in rock: pilot trials in luea and preliminary design of a full-scale installation.** Anderson, S.; Johansson, A.; Nordell, B.; Abyhammar, T. (Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). 1983. 72p. NTIS, PC E04/MF E01.

Results from several theoretical analyses and practical trials, either completed or in progress, indicate that borehole heat stores in rock can be a competitive alternative to other means of large-scale heat storage. The field trials described in the report, together with such existing results, indicate that the borehole heat store has now reached the stage where it can be regarded as suitable for testing in an experimental and demonstration installation on a larger scale.

2509 Batteries

57208 **(ANL/OEPM—83-9) Research, development, and demonstration of lead-acid batteries for electric-vehicle propulsion. Annual report for 1982.** Bowman, D.E. (Johnson Controls, Inc., Milwaukee, WI (USA). Globe Battery Div.). Aug 1983. Contract W-31-109-ENG-38. 70p. NTIS, PC A04/MF A01. Order Number DE84000368.

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Research programs on lead-acid batteries are reported that cover active materials utilization, active material integrity, and some technical support projects. Processing problems were encountered and corrected. Components and materials, a lead-plastic composite grid, cell designs, and deliverables are described. Cell testing is discussed, as well as battery subsystems, including fuel gage, thermal management, and electrolyte circulation. (LEW)

57209 **(ANL/SPG—24) Annotated bibliography of battery evaluations.** Walsh, W.J.; Elliott, R.C.; Barghusen, J.J.; Mueller, R.O. (Argonne National Lab., IL (USA)). Jun 1983. Contract W-31-109-ENG-38. 219p. NTIS, PC A10/MF A01. Order Number DE84000653.

This document is a bibliography of more than 450 publications covering systems studies, comparative evaluations, and assessments of battery technology for the period 1976 to 1982. An annotated commentary summarizing each publication's content and giving perspective is included. The listings are indexed by first author and by electrochemical system.

57210 **(LBL—16235) Application of surface-physics techniques to the study of electrochemical systems.** Ross, P.N.; Wagner, F.T. (Lawrence Berkeley Lab., CA (USA)). Jul 1983. Contract AC03-76SF00098. 59p. (CONF-830999—2). NTIS, PC A04/MF A01. Order Number DE84000957.

From 34. ISE meeting; Erlanger, F.R. Germany (18 Sep 1983).

The experimental methods that have evolved out of several years of effort at different laboratories to study emersed electrodes by uhv techniques that probe the outer surface are discussed. The problem of electrode surface structure determination by electron diffraction methods is also discussed, and examples are given of other types of studies that can be done with such methods. The apparatus for uhv analysis of emersed electrodes is described, and the emersion of metal electrodes is explained. Selected results using directly coupled systems are given for adsorbed on emersed electrodes studied by electron spectroscopy and thermal desorption and for structure determination for emersed electrode surfaces using low energy electron diffraction. (LEW)

57211 **(LBL—16556) Battery transport data. Final report, 1 May 1982 - 30 April 1983.** Bhakta, S.D. (Brigham Young Univ., Provo, UT (USA)). Apr 1983. Contract AC03-76SF00098. 39p. NTIS, PC A03/MF A01. Order Number DE84001640.

Measurements of the equilibrium properties have been accomplished for NaOH-H_2O-Nafion membrane system. The data for 1, 4, 8, and 12 M NaOH at temperatures of 28°C, 50°C, 70°C, and 90°C were obtained by a combination of soaking, blotting, weighing, and analysis techniques. The parameters determined were: (1) membrane anion concentration; (2) membrane water concentration; (3) membrane fixed ion concentration; and (4) wet membrane density. The water concentration in the membrane decreased with the external NaOH concentration at a given temperature whereas the other parameters increased. Electrodialysis and dialysis measurements have also been made at room temperature using a cell similar to the one used by Pintauro (1980). There was a problem of gassing of the electrode which made it impossible to accurately measure the volumetric flow through the membrane. Nickel and cadmium porous electrodes were tried unsuccessfully. On the porous Ni electrode, the gassing was not as much as that observed with Cd electrodes. The concentration difference and the volumetric flow rate through the membrane were measured. Using this information, the transference number was calculated using the equation t/sub +//sup m/ = /V°C/sub e/° - / F/Q where V° and V/sup F/ are the initial and final chamber volumes. C/sub e/° and C/sub e//sup F/ are the initial and final bulk solution concentration and Q is the total charge passed. The transference number (t/sub +//sup m/) decreased with the external NaOH concentration. To overcome the problem of gassing, a weighing technique is now being used. Reverse osmosis experiments were conducted at concentrations of 1, 4, and 8 M NaOH and at temperatures of 23, 50, 70 and 88°C. The flow rate through the membrane decreased with high external concentrations of NaOH at a given temperature. With the increase in temperature, the flow rate increased.

57212 **(LBL—16557) Development of multicomponent transport theory and transport data for membranes in concentrated electrolytes. Final report.** Ruggeri, R.T.; Beck, T.R. (Electrochemical Technology Corp., Seattle, WA (USA)). Jul 1983. Contract AC03-76SF00098. 64p. NTIS, PC A04/MF A01. Order Number DE84001846.

This report summarizes the effort to extend the theory and measurement techniques of multicomponent mass transfer in membranes. The results of the early experiments suggested that the transport properties might be accurately determined using a radiotracer method, and that certain transport properties of Nafion might depend strongly on the applied current density. Therefore, a program was initiated to investigate the effects of current density on the membrane transport properties using a radiotracer technique. The solubilities of sodium and chloride ions in Nafion 7-1100 have also been determined. It is concluded that the radiotracer method is a viable means of determining multiple transport numbers and self-permeability coefficients in a single experiment. Further, the method is at least as accurate as the more conventional Hittorf method. It is apparent that these radiotracer methods can be effectively utilized in the investigation of multicomponent mass transfer in a wide variety of membranes.

57213 **(LBL—16558) Principles of superionic conduction. Annual summary report for 1982.** Wuensch, B.J. (Massachusetts Inst. of Tech., Cambridge (USA). Dept. of Materials Science and Engineering). Jul 1983. Contract AC03-76SF00098. 10p. NTIS, PC A02/MF A01. Order Number DE84001215.

Alkali-ion conductors of relevance to battery systems and other solid-electrolyte applications have been examined in an attempt to gain insight into the principle which govern fast-ion conduction. The program has two main tasks: performing exploratory syntheses, characterization, and conductivity measurements of possible new fast-ion conductors; and determination of crystal structures, using X-ray or neutron scattering, of materials of high conductivity and in which a marked variation of property with structure and chemistry is apparent. (LEW)

57214 **(SAND—83-7108) Development of a circulating zinc-bromine battery, Phase II. Final report.** Bellows, R.; Einstein, H.; Grimes, P.; Kantner, E.; Malachesky, P.; Newby, K.; Tsien, H.; Young, A. (Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.). Oct 1983. Contract AC04-76DP00789. 165p. NTIS, PC A08/MF A01. Order Number DE84001886.

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This report summarizes Phase II of a multi-phase program aimed at developing Exxon's circulating zinc-bromine battery into an advanced energy storage system. Previous work at Exxon had developed a basic zinc-bromine battery system approach. This approach utilizes carbon-plastic electrodes in a bipolar stack design, a circulating electrolyte with separable bromine complexes, and shunt current protection. Phase II was highlighted by the successful scale-up and demonstration of a 20 kWh zinc-bromine battery module. Important technology improvements were demonstrated in the areas of extended life cycling, low cost stack technology, high power/high efficiency supported electrolytes, and system auxiliaries. The basic technology was augmented via increases in parametric testing, materials testing, and electrolyte studies. Production cost estimates from Phase I ($28/kWh in 1980$) were projected to an OEM price of $37/kWh using the A.D. Little costing method. A revised cost analysis, using an approach in which all battery components are produced at the battery manufacturing facility (as compared to the original analysis based on purchase of cell components from plastics fabricators) showed essentially the same factory costs as the original estimate (~ $28/kWh). A design has been developed for a prototype 20 kWh energy storage system which will be delivered to Sandia National laboratories in 1983 near the completion of Phase III. Project effort is continuing to show steady progress toward the attainment of this goal.

29 ENERGY PLANNING AND POLICY

57215 (DOE/IG—0198) Management use of experts, consultants, and support services at Headquarters and three field locations. (USDOE Office of Inspector General, Washington, DC). 14 Oct 1983. 21p. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

Report to the Secretary.

At the three field locations, consultants were frequently paid more than they would have been paid had they been employed under the criteria set forth in DOE Order 3304.1. The method used to avoid the pricing criteria was to procure the services by contract or purchase order rather than by the more appropriate employment agreements. Noncompetitive procurement justifications were not consistent with the criteria prescribed in DOE Order 4200.1 and deprived the Department of the benefits obtainable through competitive procurement processes in a number of instances. Other internal controls were reasonable to assure compliance with the Department's procurement criteria regarding the consultant and support service procurements. Recommendations that: program officers be instructed to obtain consultants through the appropriate personnel office; contract officers refer all consulting work to the appropriate personnel office for compliance with DOE pricing criteria; appropriate market search procedures in Order 4200.1A are properly implemented; and DOE procurement regulations for noncompetitive awards be modified to include purchase orders. The Assistant Secretary, Management and Administration, disagreed with our findings and recommendations.

2901 Energy Analysis And Modeling

REFER ALSO TO CITATION(S) 56858, 56892, 56901, 56902

57216 (DOE/EP—0104) Appraisal report of the International Energy Agency Fourth Allocation Systems Test (AST-4). (Department of Energy, Washington, DC (USA)). 24 Aug 1983. 22p. NTIS, PC A02/MF A01. Order Number DE84001526.

The fourth test of the International Energy Agency (IEA) Emergency Sharing System (AST-4) was most beneficial for the US National Emergency Sharing Organization (NESO). It provided an opportunity for participants to have hands-on experience in carrying out NESO responsibilities in connection with the IEA Emergency Sharing System. It also promoted a greater awareness within the US NESO, other federal agencies, states, and the private sector of the effects of an energy emergency. Finally, AST-4 revealed issues and problems associated with both the IEA system and severe energy emergencies in general, which would have most likely remained less evident were it not for the regimen of the test. The objectives and accomplishments of US participation in AST-4 were: to train US NESO personnel in the data handling, analytic, and administrative procedures necessary to carry out US responsibilities in connection with the operation of the IEA emergency oil sharing system; to otherwise involve, to the fullest extent practicable, all elements of the NESO essential to the efficient and successful operation of the IEA system including national emergency procedures; to test modifications and improvements made to the IEA system since the last test in the autumn of 1980; and to exercise, within practicable limits, decisionmaking, communication, and other federal and state government procedures in connection with a broad range of public and private activities which may be initiated in response to an energy supply disruption, both internationally and within the United States.

57217 (ESC-WR—83-06) Effects of some industrial cogeneration-options on the energy supply of the Netherlands. Evaluation based on the energy model SELPE for the project 'Cogeneration'. Boonekamp, P.G.M. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). May 1983. 33p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

Considered are the effects of industrial cogeneration on a national Netherlands scale ('WKK'-study). Use is made of the energy model SELPE for the Netherlands energy supply in the year 2000 according to SELPE calculations for the 'EZ/Referentiescenario'. Given is a description of industrial cogeneration according to modelling along the lines of SELPE. Treated is the difference between the WKK-study and SELPE for determination of financial attractivity of industrial cogeneration. Sensitivity analyses are given for the cost advantages of different specifications of cogeneration systems and several reference systems for electricity and heat production. Described is a number of effects on the energy supply of industral cogeneration (energy consumption, costs, emissions).

57218 (ESC-WR—83-07) Calculations with the energy model SELPE: energy-input in the Public Discussion scenarios. Boonekamp, P.G.M. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). May 1983. 75p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

Compared are four energy scenarios, the 'Referentie-scenario' of the Dutch Ministry of Economic Affairs, abbreviated EZ, two scenarios drafted on behalf of the Public Discussion on Energy (MDE) and the scenario 'Realistic Alternative' drafted by CE (Center for Energy saving). The scenarios drafted on behalf of Public Discussion on Energy (MDE) are based on the view points 'Industrial Recovery' and 'Labor Division'. The data for the basis year 1980 are given by a publication of the Dutch Office for Statistics (CBB) called 'De Nederlandse Energiehuishouding' (The Dutch Energy Economy). The data for the years 1990 and 2000 are extrapolated from the data of the year 1980 by calculations according to the energy model SELPE. (10 figs., 3 schemes, 17 tables).

57219 (ESC-WR—83-11) Evaluation of the first phase of the COMPASS-project. Goumans, J.J.J.M. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). Jun 1983. 78p. (In Dutch). ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

A comparative assessment study has the aim to compare different systems on some well defined aspects. The COMPASS-project, carried out under the auspices of the OESO, compares different energy systems and analyses macro-economic and environmental effects. After an introduction to comparative assessment, a case-study is reported on space heating and cooling with respect to the environmental effects for a town called Fredericton in Canada.

57220 (ESC-WR—83-13) Exploring some long-term energy scenarios for the Netherlands using MARKAL. Contribution to phase III of the IEA Energy Technology Systems Analysis Project. Kram, T. (Stichting Energieonderzoek Centrum Nederland, Petten. Energie Studie Centrum). Jul 1983. 92p. ECN, P.O. Box 1, 1755 ZG Petten, Netherlands.

At the end of phase II it was felt by both the IEA and the participating countries that a follow-up programme was desirable in order to make use of the investments made in phase II. It was decided to carry out a phase III programme of work until the end of 1982, later extended to May 1983. By the end of 1981 the Netherlands decided to participate in ETSAP. The phase III programme of work covered the further extension and improvement of MARKAL, an updating of the energy technology characterization database and the calculation of a new set of scenario runs by the participants using revised assumptions. The present report is the Country Report for the Netherlands, containing a detailed description of the work carried out within the ETSAP framework between the beginning of 1982 and February 1983. The Netherlands Energy System Database compiled for ETSAP phase III, is described. It contains assumptions about energy sources, conversion technologies and demand sectors. Analyzed were two ETSAP base cases and two Low Demand sensitivity scenarios.

57221 (EUR—8292-EN) Critical assessment of the first results of the EFOM 12C model. Thonet, C.; van der Voort, E.; Love, P.; Jadot, P. (Commission of the European Communities, Brussels (Belgium). Directorate General for Science, Research and Development). 1983. 142p. Commission of the European Communities, Luxembourg.

Supply and demand are the two pillars fo the EC energy Modelling System developed by the Commission of the European Communities during the excecution of the first two energy RandD programmes of DG XII (Science, Research and Development).

Started in 1975 this activity lead to the development of an integrated set of models for the purpose of assessing the interaction between energy and economy. A comprehensive description of these models is to be found in which also contains a description of the first version of the supply models now being utilised by DG XII. The main objective in the use of EFOM-12C is to realise national harmonised case studies for the energy supply in the EC member states. It is also a tool for mutual comparison and understanding, while it is also being used in several countries for policy assessment studies. These case studies are carried out by a central team collaborating with national expert teams working on similar issues for their own authorities. Each national representation of the energy system is characterised by some 8,000 items per country and this constitutes a vast techno-economic European Energy Data Base (EEDB). In a second stage this EEDB has been harmonised country by country with the collaboration of these national teams. The object of this present paper is that of a cross-validation of these results through the use of statistical techniques.

57222 **(EUR—8294-EN) UK implementation of MEDEE 3.** Thomas, S. (Commission of the European Communities, Luxembourg. Directorate-General for Science, Research and Development). 1983. 68p. Commission of the European Communities, Luxembourg.

For the long-term energy demand forecast the MEDEE 3 model was chosen and in 1979 the Energy Programme of the Science Policy Research Unit (SPRU) of the University of Sussex was chosen as the UK contractor for the implementation of the UK case study using this model. The MEDEE 3 model used for the current exercise is a highly disaggregated model and requires a large amount of data about the populations of homogeneous groups of energy uses or users (e.g. the number of dwellings of a certain type, age and size) as well as the technical parameters of energy-using equipment (eg fuel consumption of goods vehicles). The initial runs have been conducted using a data base compiled by IEJE with a base year of 1975. After a number of preliminary runs, a case study has been completed using macro-economic and energy price assumptions provided by DG XII. The detailed assumptions and results of this work are reported.

57223 **(EUR—8320-EN) Updating of EXPLOR and EDM models and the reference case study simulation.** Hughes, C. (Commission of the European Communities, Luxembourg. Directorate-General for Science, Research and Development). 1983. 64p. Commission of the European Communities, Luxembourg.

The definition of the tasks in the contract relating to Explor and EDM is as follows: Projections of I/O coefficients for 1980, 1985 and 1990. Updating of exogeneous Explor data. Re-estimation of EDM equations using the latest historical data. The basis for the projections and updating of the exogeneous data for Explor is the database of the Cambridge Multisectoral Dynamic Model (MDM), of the UK economy.

57224 **(EUR—8362-EN) European energy model long-term demand forecasting application of the model MEDEE-3 to France.** Labrousse, M. (Commission of the European Communities, Brussels (Belgium). Directorate General for Science, Research and Development). 1983. 69p. Commission of the European Communities, Luxembourg.

The long term energy demand model MEDEE has been used in a multinational study undertaken by the EEC. This report provides a concise description of the principal mechanisms of the model. The report also presents the results of a case study which did not include any strong energy policies and represented an economic growthrate of approx. 3% p.a.. The resultant increase of final energy consumption (2.1% until 1990, 1.6% from 1990 to 2000) remained below the economic growthrate.

57225 **(EUR—8636-EN) EFOM 12-C case studies candidate technologies to relieve the European energy system. Final report.** Faraco, F.; Merzagora, N.; Tamburrano, A. (Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Direzione Centrale Studi dell'Energia Nucleare e delle Energie Alternative (ENEA)). 1983. 79p. European Community Information Service, 2100 M Street, NW, Suite 707, Washington, DC 20037.

This study considers the introduction of new technologies, analyses their impact on the energy system, assesses their growing penetration, and evaluates their influence on the dependence from non-renewable energy sources. The EFOM 12-C linear optimization model was used in the study. The main results are: (a) Primary Energy - In case 2 and 3 (imports minimization) a decrease in the consumptions of liquid and solid fuels and steady consumptions of natural gas and nuclear energy can be noticed; (b) Final Energy - The most significant variations take place in the IRON-STEEL Subsystem (smaller consumptions of solid fuels) and in the TERTDOM sector (substitution of liquid fuels by natural gas); and (c) New Technologies - The coal liquefaction and gasification technologies, as well as biogas and heat pumps are not competitive, while the other new technologies, excepted MHD and centralized production of solar energy in case 1, are developing extremely fast. Of particular significance are building insulation and biomass and, in case 2 and 3, MHD technology. It is also opportune to recall that main target of this study is testing an analysis methodology of the penetration of new technology, without aiming at achieving reliable nor final results. A more weighted and accurate analysis of the data relating to the traditional process and the new technologies will allow much less questionable results to be obtained.

57226 **(KFK—3478) Energy modelling with SOPKA-E for the energy paths of the Commission of Inquiry on "Future nuclear energy policy".** Faude, D. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Neutronenphysik und Reaktortechnik; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Schneller Brueter). Mar 1983. 115p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751160.

The Commission of Inquiry on "Future nuclear energy policy" of the 8th Deutscher Bundestag has examined the question of the long-term exploitation of nuclear energy in the Federal Republic of Germany within a more general framework of energy policy and, for this purpose, created the concept of energy paths. To calculate these energy paths, the SOPKA-E simulation model has been developed and applied at the Karlsruhe Nuclear Research Center. In Chapter 2, the central part of this report, the form and contents of path modeling are described in detail. To help readers understand the energy paths concept, the general background of energy policy in the seventies, which gave rise to the contents of the energy paths, is outlined in a survey article in Chapter 1. Chapter 3 is a description of the energy projections contained in the joint expert opinion on the third updated version of the Energy Program in the light of the energy paths. In Chapter 4 some approaches - albeit fragmentary - are outlined which have been adopted by the Commission of Inquiry of the 9th Deutscher Bundestag in adapting energy paths to the present situation. The presentation in this report of the model computations with SOPKA-E is meant to be a documentation.

57227 **(PB—83-240648) Energy models for Denmark MEDEE 3: Application of the long term energy demand model to Denmark - Part 3. Final report.** Mackenzie, G.A. (Commission of the European Communities, Luxembourg). [nd]. 169p. (EUR—8036-EN). NTIS, PC E08/MF E08.

The energy model MEDEE 3 simulates the changes in energy demand over a 20-30 year period. A general introduction includes details of the classification structure of urban areas and industries. The emphasis of the report is on the preparation of the scenarios, the definition of the descriptors used, and the construction of the tabular functions which are quantitative values associated with individual scenario descriptors. The importance of space-heating and transport as energy consumers is discussed with information on data transfer from other classification systems to the MEDEE 3 model. An outline of macroeconomic projections from medium-term models, EDM, EXPLOR, and EUREKA is given. Basic data for Denmark are shown in appendices. (Copyright (c) ECSC-EEG-EAEC 1982.)

57228 **(PB—83-241356) Energy models for Denmark EXPLOR-EDM. Final report.** Morthorst, P.E. (Commission of the European Communities, Luxembourg). [nd]. 47p. (EUR—8051-EN). NTIS, PC E03/MF E03.

Recent developments in the medium-term energy demand models for Denmark are reported. The improvements made to both the input-output model EXPLOR and the energy demand model EDM are discussed with details of new aggregation schemes. The main advantage of the modifications is the improvement in forecasting with both models; other advantages are outlined. The preliminary case study using the EXPLOR and EDM models is described; detailed results are given in tabular form.

57229 **Use of simulation models in energy planning. Proceedings of the international conference held at Risoe National Laboratory 9-11 May 1983, Roskilde, Denmark;** Risoe National Laboratory (1983). 522p. (CONF-8305114—). Energy Systems Group, Risoe National Laboratory, DK-4000 Roskilde, Denmark.

From Riso international conference on the use of simulation models in energy planning; Riso, Denmark (9 May 1983).

In recent years energy systems models have played an increasingly important role in the energy planning carried out for an by public authorities, energy utilities, oil companies, etc. In particular, simulation models have emerged as a useful energy planning tool for the assessment of various aspects of the technical and economic behaviour of existing and future energy systems e.g. forecasting of energy demand, planning of investments and determination of operating strategies. The aim of the conference was to bring together scientists, economists and energy planners with a mutual interest in the use of simulation models in an energy planning context. For that reason emphasis was put on the application of simulation models and their role in past and future energy planning. The conference was organized with three main titles for the sessions: Global and Multinational Studies, National Energy Studies, and Sectoral Energy Studies. The subjects presented ranged from world oil resources to simulation studies of single factors, while the model types dealt with ranged from macroeconomic models to technical models. The total number of papers presented at the conference was 35, of which 7 were invited. The closing session took the form of a panel discussion, a transcription of which is included in this volume along with all the invited and contributed papers.

2902 Economics And Sociology

REFER ALSO TO CITATION(S) 57013, 57219, 57886

57230 **(N—8322673) Role of energy resources in New Mexico.** (New Mexico Energy and Minerals Dept., Santa Fe (USA)). 1982. 4p. NTIS, PC A05/MF A01.

In Energy Resources in New Mexico, p 13-16 (See N83-22672 12-42).

The development of energy resources, particularly oil and gas, has contributed a major share of New Mexico's revenues and provided a predominant component of the economic base. The dependency of the development of what was considered abundant resources was the basis for economic growth and stability. This dependency may be disruptive to the future economic stability, and if a diversification of the economy does not take place, the state may be in danger of approaching the future without a strong economic base.

57231 **Nordiske energiplaner og energipriser. (Scandinavian energy plans and energy prices).** Stockholm, Sweden; Liber distribution, Foerlagsorder (1982). 101p. (In Norwegian). (NU—1982-8).

The report deals with the elements and the policy of the energy planning of different Nordic countries. The energy structure of these countries is of very different kind. The cooperation in the field of electric energy, however, has taken place for many years. The planning and the determination of prices is discussed in order to improve the cooperation.

2903 Environment, Health, And Safety

REFER ALSO TO CITATION(S) 56850, 56861, 56890, 56891, 56991, 56992, 56993, 57014, 57022, 57200, 57243, 57708, 57911

57232 **(DOE/NBM—4001053) Solid wastes from energy producing technologies: workshop on research needs. Subsurface Transport Program. Summary report.** Wobber, F.J. (USDOE Office of Energy Research, Washington, DC. Ecological Research Div.). Feb 1981. 86p. NTIS, PC A05/MF A01. Order Number DE84001053.

A workshop was held June 30 to July 2, 1980 to define the scope and to identify specific research needs for a comprehensive program plan related to solid wastes from energy-producing technologies. The workshop identified research that might be needed to resolve the scientific uncertainties about disposal of large volumes of energy-related solid wastes in the environment. Many of the tasks described herein are appropriate for engineering control of solid wastes and are included for completeness.

57233 **(IIUG-pre—82-9) Findings and problems of comparative political analysis on an international scale. The example of air pollution abatement policy.** Weidner, H.; Knoepfel, P. (Wissenschaftszentrum, Berlin (Germany, F.R.). Internationales Inst. fuer Umwelt und Gesellschaft). 1982. 58p. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

Advantages and disadvantages of the informed-cooperation organisational concept are discussed. More emphasis on linking research management with methodological and theoretical problems is recommended. Clean air policy problems in international comparison are presented with implementation strategies proposed.

57234 **(N—8321649) Review of the global environment 10 years after Stockholm.** (Committee on Foreign Affairs (U.S. Congress. House), Washington, DC). 1982. 534p. (GPO—97-152). Avail: Subcomm. on Human Rights and International Organizations.

GPO Hearings before the Subcomm. on Human Rights and Intern. Organ. of the Comm. on Foreign Affairs, 97th Congr., 2d Sess., 30 Mar., 1 and 20 Apr., 1982.

International Environmental Policy has three major areas of focus: establish a scorecard of the major accomplishments and failures since Stockholm, assess where we stand today in relation to global environmental problems, and explore the global environmental agenda for the 1980's.

57235 **Energy risk analysis and data collection.** Hoy, H.C. (Oak Ridge National Lab., TN (USA)). *Annals of Nuclear Energy;* **10**: No. 3-4, 169-175(1983).

In comparing occupational risks for various conventional and emerging, or non-conventional, energy technologies, many basic data sources are used: Mine Safety and Health Administration, Occupational Safety and Health Administration, Bureau of Labor Statistics, National Safety Council, Department of Transportation, Railway Transportation Administration, U.S. Coast Guard, Department of Energy and others. However, since the various data systems collect data for their own specific purposes, great care must be taken to ensure that the data and risk-analysis criteria are indeed applicable to the concerned technology and that the data can be normalized to the same basic unit before comparisons are made. The danger of using incomplete data or data collected in only one area is illustrated, and it is demonstrated that using inadequately-evaluated data can lead to errors of factors of 3 to 5.

57236 **Why risk-free energy isn't what is seems to be.** Inhaber, H. (Oak Ridge National Lab., TN (USA)). *Annals of Nuclear Energy;* **10**: No. 3-4, 177-186(1983).

The risks associated with different energy systems are calculated and compared. It is found that when the entire cycle is considered energy systems such as solar or wind are calculated to have some risk. Of the eleven systems considered, coal and oil are shown to have the highest total risk, due to air pollution effects. Natural-gas-fired electricity and nuclear have the lowest. At least one form

of energy conservation appears to have relatively high risk per unit of energy saved.

2904 Natural Resources

REFER ALSO TO CITATION(S) 56850

57237 (TVA/PUB—84/4) Estimated ownership and operating costs for selected types of retail fertilizer facilities - 1983 update. Simpson, S. (National Fertilizer Development Center, Muscle Shoals, AL (USA)). Oct 1983. 30p. NTIS, PC A03/MF A01. Order Number DE84900075.

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Cost estimates are provided for alternative fertilizer distribution facilities and methods a retail fertilizer dealer can use to estimate the cost of production and improve economic efficiency. The dealer can then use cost estimates to change the gross margin to accomplish his income objectives.

2905 Research, Development, Demonstration, And Commercialization

REFER ALSO TO CITATION(S) 57055, 57225, 57249, 57531, 57863

57238 Katsaus energiatutkimukseen 1982. (Energy research in Finland 1982. A review). Helsinki, Finland; Valtion painatuskeskus (1983). 118p. (In Finnish).

The annual review 1982 consists the data of research projects financed by Ministry of Trade and Industry and public financing activities in energy research.

2906 Nuclear Energy

REFER ALSO TO CITATION(S) 56923, 56949, 56953, 56991, 56992, 56993, 57135, 57182, 57185, 57191, 57200, 57226, 57708, 57886, 57911

57239 (N—8321501) Nuclear power compared with other energy sources: A brief comparative study of some of the risks. Wible, P. (Central Electricity Generating Board, London (UK)). Oct 1983. 24p. Avail: British Library Lending Div., Boston Spa, Engl.

Transl. into English of report from Federation Romande pour l'Energie Lausanne, Switzerland, 1980, 20 p.

Some of the risks involved in the major energy sources were studied.

57240 (NUREG—0540-Vol.5-No.7) Title list of documents made publicly available. (Nuclear Regulatory Commission, Washington, DC (USA). Div. of Technical Information and Document Control). Jul 1983. 530p. NTIS MF A01 - GPO. Order Number DE84900181.

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The Title List of Documents Made Publicly Available is a monthly publication. It contains descriptions of the information received and generated by the US Nuclear Regulatory Commission (NRC). This information includes (1) docketed material associated with civilian nuclear power plants and other uses of radioactive materials and (2) nondocketed material received and generated by NRC pertinent to its role as a regulatory agency. As used here, docketed does not refer to Court dockets; it refers to the system by which NRC maintains its regulatory records. This series of documents is indexed by a Personal Author Index, a Corporate Source Index, and a Report Number Index.

2907 Transport And Storage

REFER ALSO TO CITATION(S) 57203, 57209

2908 Waste Heat Utilization

57241 (N—8322738) Possibilities of improving degree of perfection and effectiveness of use of secondary thermal energy resources. Gornostaev, L.S.; Demchenko, F.N.; Drachenin, E.A.; Zhidkov, N.I. (British Library, Boston Spa. Lending Div.). Dec 1982. 11p. Avail: British Library Lending Div., Boston Spa, Engl.

Transl. into English from Stal (USSR), No. 12, 1981, p 18-21.

A thorough examination is made of the most rational methods of improving the effectiveness of secondary thermal energy resources (STER) within a district-heating system centered on an integrated iron- and steelworks (IISW). STER must not be utilized haphazardly, but in an extremely rational fashion to give greatest possible fuel efficiency. In particular, supplanting the heat from the turbine bleeds of central heating-and-power-secondary steam power plants (EGP-SGP), which reduces the production economy of electrical and mechanical power, is acceptable only in special cases. The main trend in the utilization of STER at a works with full processing cycle should, owing to the particular characteristics of its energy balance, lie in the direction of heating power, namely in district-heating system turbines. The STER steam parameters of many heat raising plants should be raised to power-parameter values, the costs of such practice being defrayed within a year.

2910 Conservation

REFER ALSO TO CITATION(S) 57263, 57267, 57269, 57270, 57276, 57286, 57288

57242 (N—8322737) Higher level of utilization of fuel-energy resources. Petrakovskii, A.P.; Afansev, G.P. (British Library, Boston Spa. Lending Div.). Dec 1982. 7p. Avail: British Library Lending Div., Boston Spa, Engl.

Transl. into English from Stal (USSR), V. 12, 1981 p 7-8.

Measures taken to achieve economies in fuel and power utilization, mainly during the 10th five year plan are reviewed, with particular reference to the use of secondary fuel energy resources and their prospective utilization in the region during the period 1981-1985.

2920 Supply, Demand, And Forecasting

REFER ALSO TO CITATION(S) 56903, 57222, 57251, 57252

2930 Policy, Legislation, And Regulation

REFER ALSO TO CITATION(S) 57013, 57014, 57126, 57229, 57231, 57269

2940 Fossil Fuels

REFER ALSO TO CITATION(S) 56856, 56858, 56890, 56891, 56892, 56892, 56893, 56893, 56901, 56902, 56903, 56908, 56910, 56910, 56911, 57126, 57129, 57216, 57250

57243 Sikkerhetsstyring og reguleringsteknikk. Oljedirektoratets regulering av sikkerheten ved produksjon av petroleum. (Safety management and control policy. A study of the safety regulation of offshore oil activity by the Norwegian Petroleum Directorate). Graver, H.P. Oslo, Norway; Sjoerettafondet (1983). 233p. (In Norwegian).

English summary, 12 p.

The Norwegian Petroleum Directorate (NPD) is the main administrative body with responsibility to regulate and control the safety aspects of drilling for and production of petroleum on the Norwegian Continental Shelf. Its responsibility does not, however, include the aspects of maritime safety, which are regulated by the

Norwegian Maritime Directorate. This study is limited to the regulation of safety on fixed installations for production of petroleum. The object has been to describe the methods applied by the NPD to achieve better safety, and to give answers to why these specific methods of approach have developed as they have. A conclusion that may be drawn from this study is that there exists a relationship of close cooperation between the NPD and the oil industry represented by the operating companies. Only this can explain the differences we find in the NPD approach as compared to the approach of other parts of public administration. Such a relationship probably leads to better safety within the scope of technical rationality than would have a more hostile relationship between the Directorate and the industry. This has its price, however. Aspects of the safety question not included within the limits of a purely technical approach are not as easily taken into account. Partly due to this fact, other parties with interests in safety are not represented.

2950 Hydrogen And Synthetic Fuels

REFER ALSO TO CITATION(S) 57033

2960 Electric Power

REFER ALSO TO CITATION(S) 57128, 57130, 57217, 57250

57244 (DOE/NBM—3017756) Alaska electric power statistics, 1960-1982. Eight edition. (USDOE Alaska Power Administration, Juneau). Aug 1983. 55p. NTIS, PC A04/MF A01. Order Number DE83017756.

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Statewide power generating capacity at the end of 1982 totaled over 2.1 million kilowatts of which 67% was in the utility sector. Net production of electric energy totaled 5.7 billion kilowatt hours with 65% by the utility system. Total 1982 energy production was 8.9% above the prior year; energy produced by the utilities in 1982 was 13.1% above the prior year. Data presented in the report show large increases in 1982 in the Anchorage-Cook Inlet, Fairbanks, and Juneau areas as well as for many smaller utility systems. Generating plant additions in 1982 totaled 41 MW, or a 2% increase. Between 1979 and 1982, the share for natural gas increased from 55.9% to 59.1% while the share for oil dropped from 17.9% to 15.2%. The hydro share will increase somewhat in the near future with completion of the several projects in the State Power Authority program. Statewide averages for residential customers in 1982 was 6.7 cents per KWH, a 34% increase since 1979. Rates remain much higher for most smaller systems.

57245 (DOE/RA/50255—T2) Multiple-strategy interaction for industry functional modeling. Technical progress report. (Dynamic Systems, Urbana, IL (USA)). Nov 1982. Contract AC01-80RA50255. 87p. NTIS, PC A05/MF A01. Order Number DE84000485.

The three-year project is organized in four tasks. The first task, Noncausality in Multiple Decision-Making maintains the theme of the project by relating specific issues in the other three tasks to the central question of noncausality in models of complex systems, particularly in those systems involving multiple decision makers. The second task, Team-Optimal Leader-Follower Strategies with Dynamic Feedback, was performed and completed during the first year of the program. Sufficient conditions for Leader-Follower strategies to be team-optimal for the leader were derived for continuous-time dynamic systems when the feedback strategy is a function of the state, and when the control law is represented by a finite dimensional dynamic system. The third task, Well-Posedness and Control-Dependent Reduced Order Models, has been under investigation for part of the first year and the entire second year. The third task has three objectives. Firstly, we seek to develop appropriate reduced order singularly perturbed models when different decision-makers have different perceptions and different goals. Secondly, we seek to exploit chained aggregation methods to simplify decentralized control design. Thirdly, we seek to establish the well-posedness of various reduced order noncausal models, obtained by singular perturbations, under the Nash, Leader-Follower, and Pareto-optimal strategy concepts. Task 4, Validation of Policy Models Using a Leader-Follower Framework will be activated in the third c

57246 (N—8322752) Cogeneration and small power production. (Committee on Energy and Commerce (U.S. House), Washington, DC). 1982. 383p. (GPO—99-464). Avail: Subcommittee on Energy Conservation and power.

GPO Hearings on H.R. 6500 before the Subcomm. on Energy Conserv. and Power of the Comm. on Energy and Com., 97th Congr., 2d Sess., 15 Jun 1982.

A Federal legal presumption in favor of the avoided cost rule to govern purchases by utilities from qualifying cogeneration and small power production facilities is proposed. States and nonregulated utilities are authorized to deviate from this rate under certain conditions, and may continue to negotiate and agree to any rate for purchase. On interconnection, the bill would create a Federal duty among utilities to connect their facilities with those of qualifying facilities, subject of course, to the requirement that these facilities pick up the costs for that interconnection.

57247 (TVA/PUB—84/2) Load forecast and power supply summary prepared for fiscal year 1984. (Tennessee Valley Authority, Chattanooga (USA). Office of Power). Aug 1983. 118p. NTIS, PC A06/MF A01. Order Number DE84900072.

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This year's review of TVA's load forecasts and power supply situation indicates that TVA will have ample capacity to support high economic growth in the TVA region. Compared with last year's load forecasts, this year's forecasts have declined slightly. If load growth is equivalent to TVA's high forecast, the earliest TVA would need capacity beyond the construction of Bellefonte nuclear plant and capacity additions from our ongoing conservation and load management programs is 1996-1997. This is approximately two years later than indicated in last year's power supply review. Even with this later date for the need for capacity, TVA's economic analysis indicates that the continued deferral of Hartsville A and Yellow Creek nuclear plants in the best interest of the TVA ratepayer.

57248 Electric ARM to gather end-use data. Lihach, N.; Beardsworth, E. *EPRI (Electric Power Research Institute) Journal;* 8: No. 6, 24-27(Jul-Aug 1983).

A better way to collect the detailed end-use load information that utilities need to prepare more-accurate load forecasts and to develop effective conservation and load-management programs is discussed. The electric appliance research metering (ARM) system, developed by the Electric Power Research Institute (EPRI) and Robinton Products, Inc., of Sunnyvale, California, is easy to install, less expensive than rewiring, and much more acceptable to utility customers. EPRI is applying for a patent on the system.

57249 Washington hosts EPRI's tenth anniversary. Lawrence, C. (EPRI Office, Washington, DC). *EPRI (Electric Power Research Institute) Journal;* 8: No. 6, 33-36(Jul-Aug 1983).

A special program commemorating ten years of collective research and development by the electric-utility industry was held in Washington, DC on April 12, 1983. Excerpts from the four speeches, as well as remarks made by the program chairman, Dr. Chauncey Starr, are presented.

2980 Consumption And Utilization

57250 (DOE/EIA—0035(83/09)) Monthly energy review. (USDOE Energy Information Administration, Washington, DC. Office of Energy Markets and End Use). Sep 1983. 123p. NTIS, PC A06/MF A01 - GPO. Order Number DE84000924.

Data is presented on production, consumption, stocks, imports, exports, and prices of the principal energy commodities in the US. Also included are data on international production of crude oil, consumption of petroleum products, petroleum stocks, and production of electric power from nuclear facilities.

57251 **(DOE/EIA—0420) Documentation of the PURHAPS industrial demand model. Volume II. Data sources and transformations.** Werbos, P.J. (Department of Energy, Washington, DC (USA). Energy Information Administration). Aug 1983. 133p. NTIS MF A01. Order Number DE84001378.

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This is the second volume of documentation for the Purchased Heat and Power System (PURHAPS), used to forecast industrial demand for heat and power in the Interim Future Forecasting System (IFFS), as used for the EIA 1982 Annual Energy Outlook (AEO-82). This volume specifies the data sources and the procedures used to convert raw data into a data base, as used in the model directly and in further statistical analysis. Data on the price and quantity of capital, labor, energy, and intermediate materials used in 17 manufacturing industries, from 1958 through 1979, are reproduced in the Appendix F. These data have led to a substantial change in EIA's picture of what drives industrial energy demand. Programs for reading in Census tapes, and for performing a three-dimensional RAS imputation, with use of historical ratios to develop starting approximations and procedures to account for missing row totals, are explained and reproduced in Appendix C. The RAS technique was borrowed from input/output analysis, where the letters R, A, and S refer to a commonly used matrix and vectors. The three dimensional generalization of this technique turned out to be an effective method for locating inconsistencies in the original Census data, which are discussed in some detail. Provisions for dealing with various combinations of missing values and zeroes were also important in getting reasonable values from the various stages of imputation to be discussed.

57252 **(DOE/EIA—0431) Regression analysis of energy consumption by end use.** Latta, R.B. (Department of Energy, Washington, DC (USA). Energy Information Administration). Oct 1983. 111p. NTIS, PC A06/MF A01 - GPO. Order Number DE84001290.

This report covers two main topics. The first is a description of a regression analysis of energy consumption data obtained from the 1980 Residential Energy Consumption Surveys (RECS). The second topic is a presentation of estimates of residential energy consumption by end use. The resulting estimates of consumption by end use will be of interest to a wide audience. This includes State and Federal agencies that are formulating programs for low-income energy assistance, utilities that need to forecast load demands, and other researchers who are studying the demand for energy in the residential sector. Readers who are mainly interested in the end-use estimates and not the methodology used to obtain the estimates can skip to Section 8. This report presents a discussion of the variability of energy consumption within the home. Regression equations are presented as a function of main heating fuel, water-heating fuel, weather, dwelling size, appliance stock, and other variables. Separate equations for electricity, natural gas, liquid petroleum gas, and fuel oil estimate the amount of energy consumed by end use.

2990 Unconventional Sources And Power Generation

REFER ALSO TO CITATION(S) 57013, 57014, 57022, 57054, 57055, 57055, 57062, 57063, 57101, 57103, 57283

30 DIRECT ENERGY CONVERSION

3005 Fuel Cells

57253 **(DOE/NASA—2701-3) Assessment of the environmental aspects of the DOE phosphoric acid fuel-cell program.** Lundblad, H.L.; Cavagrotti, R.R. (Aerospace Corp., El Segundo, CA (USA)). May 1983. Contract AI21-80ET17088. 186p. (NASA-CR—168131; ATR—83(3813-07)-1ND). NTIS, PC A09/MF A01. Order Number DE84001696.

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This report describes the likely facets of a nationwide phosphoric acid fuel cell (PAFC) power plant commercial system and assesses the beneficial and adverse environmental impacts produced by the system. PAFC power plants will be sited to provide on-site and electric utility power generation. Envisioned is a PAFC system consisting of production facilities, multi-kilowatt and multi-megawatt power plants, and fuel production and delivery facilities. Eleven specific system activities are characterized and evaluated. Also included is a review of fuel cell technology and a description of DOE's National Fuel Cell Program. Based on current and reasonably foreseeable PAFC characteristics, no environmental or energy impact factor has been identified that would significantly inhibit the commercialization of PAFC power plant technology.

57254 **(N—8322757) Effect of cell design and test criteria on the series/parallel performance of nickel cadmium cells and batteries.** Halpert, G.; Webb, D.A. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jan 1983. 40p. (CONF-821015—13; NASA-TM—84967). NTIS, PC A03/MF A01.

From Electrochemical Society fall meeting; Detroit, MI, USA (17 Oct 1982).

Three batteries were operated in parallel from a common bus during charge and discharge. SMM utilized NASA Standard 20AH cells and batteries, and LANDSAT-D NASA 50AH cells and batteries of a similar design. Each battery consisted of 22 series connected cells providing the nominal 28V bus. The three batteries were charged in parallel using the voltage limit/current taper mode wherein the voltage limit was temperature compensated. Discharge occurred on the demand of the spacecraft instruments and electronics. Both flights were planned for three to five year missions. The series/parallel configuration of cells and batteries for the 3-5 yr mission required a well controlled product with built-in reliability and uniformity. Examples of how component, cell and battery selection methods affect the uniformity of the series/parallel operation of the batteries both in testing and in flight are given.

57255 **Advanced fuel cell power systems for transportation applications.** Huff, J.R.; Lynn, D.K.; Murray, H.S. (Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545). *Transactions of the American Nuclear Society;* 44: 9(Jun 1983). (CONF-830609—).

From ANS annual meeting; Detroit, MI, USA (12 Jun 1983).

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

REFER ALSO TO CITATION(S) 57072, 57088, 57090, 57096, 57099, 57286

57256 **(DOE/R4/10089—T1) Urban alternative Homestead.** (Environmental Alternatives, Inc., Louisville, KY (USA)). 1981. Contract FG44-80R410089. 11p. NTIS, PC A02/MF A01. Order Number DE84000374.

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The energy-efficient model home was completed. Work was done on the inside of the house to insulate and finish the walls, build displays on insulation, fireplaces and wood heat, and educational signs depicting the workings of a building designed with active and passive solar heating and cooling. The grant made possible the installation of a Clivus Multrum composting toilet with food trap, also, and educational materials on the workings of the clivus. It made possible displays on window treatments, storm windows and doors, and installation of donated kitchen cabinets and appliances, as well as a donated furnace and ductwork. These items have made it possible to have the demonstration house open five days per week for over two years, with literally thousands of school classes, as well as adult classes taking tours at least three days per week. Literally thousands of persons have taken tours of the house where reams of educational handouts are available, and over fifty conservation workshops have been held in two years. Without the finishing touches on conservation provided by this grant, these thousands of persons would have missed this opportunity to learn about energy conservation.

57257 **(DOE/R4/10115—T1) Modulating skylight. Final report.** (Vanderhoogt (Arthur), Atlanta, GA (USA)). [nd]. Contract FG44-80R410115. 14p. NTIS, PC A02/MF A01. Order Number DE84000777.

A reflector boosted skylight with automatic controls to maintain interior light level and maximize heat capture by opening and closing the insulated reflector, was built and operated. Light levels maintained by the skylight in a small test building were monitored for a one year period and the energy saving computed by comparison to conventional fluorescent lighting.

57258 **(DOE/R4/10124—T1) Attic heat-recovery system. Final report.** (Ross (Joseph C.), Rossville, GA (USA)). [nd]. Contract FG44-80R410124. 8p. NTIS, PC A02/MF A01. Order Number DE84000197.

At the beginning of this project, I set out to develop a system at low cost which would partially recover wasted attic heat present in most homes even during moderately cold (but sunny) winter days. The resulting system has performed quite well. It's operation is easy to understand, the installation is simple and straightforward, and the installation costs are very low, especially in new houses or homes which already have a black roof. Data have been collected with the system in operation to verify system performance. Finally, the system has been fine-tuned to maximize output.

57259 **(DOE/R4/10264—T1) Wood burning fireplace. Final technical report.** (Georgia Power Co., Macon (USA)). 5 Oct 1981. Contract FG44-80R410264. 4p. NTIS, PC A02/MF A01. Order Number DE84000781.

This project involved the construction of a fireplace to heat a commercial building. The project was successful in that it demonstrated that wood could be used to heat a commercial building in a properly constructed fireplace.

57260 **(DOE/R4/10278—T1) Installation of water-to-air heat pump heating/cooling systems in structures at Leroy Percy State Park. Final technical report.** Rozzell, A. (Mississippi Dept. of Natural Resources, Jackson (USA). Bureau of Recreation and Parks). 18 Jun 1982. Contract FG44-80R410278. 2p. NTIS, PC A02/MF A01. Order Number DE84000422.

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The project involved the installation of water-to-air heat pump heating/cooling systems in three structures at Leroy Percy State Park. The three structures include the Assistant Manager's residence, Cabin No. 1 and Cabin No. 2. The project is now completed and the three structures are successfully heated by the natural hot artesian water source and are cooled by cold water available from the park's water system.

57261 **(DOE/R4/10304—T1) Wood-stove hot-water systems. Final report.** Leitman, S. (Leitman (Steve), Quincy, FL (USA)). Jul 1982. Contract FG44-80R410304. 65p. NTIS, PC A04/MF A01. Order Number DE84000348.

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The objective of this grant was to evaluate the efficiency and economics of installing hot water heating systems or wood stoves. To evaluate the efficiency, six systems were installed in North Florida households and monitored over two heating systems. Three of the systems installed were placed in the flue pipe and three in the stove box. Tests indicate the in-pipe systems yielded on an average 1575 to 1675 Btu/hour, while in-stove systems yielded from 1850 to 2700 Btu/hour on the average. A detailed analysis of the economics of system performance concluded that the installation of wood-stove hot water heating systems is a marginal investment for the Tallahassee area without the current energy tax credit program and a reasonably good investment with it. It was determined that if a person used the stove as a regular heat source in the Tallahassee area and system cost was near $400.00 that person was guaranteed to recover their investment in current dollars within the useful life of the system. As a person travels north to areas where the heating season is longer, these systems become more justified.

57262 **(DOE/R4/10404—T1) Natural gas conservation through throttling: a demonstration study. Final technical report.** Currens, V.C.; Edwards, R.G. (Edwards (R.G.), Lexington, KY (USA)). Jul 1982. Contract FG44-81R410404. 8p. NTIS, PC A02/MF A01. Order Number DE84000437.

A total of 12 homes in Lexington, Kentucky participated in a demonstration project to investigate the possible energy savings associated with a gas throttling technique applied to residential gas furnaces. In a prior study, two homes utilized the throttling technique during the winter of 1980-81 and indicated an average savings of 9% attributable to gas throttling. Results from the current demonstration project, conducted during the winter of 1981-82, showed an average savings of 7.2% resulting from the use of throttling. It is therefore, indicated that, on average, use of this simple technique can increase residential gas furnace efficiencies by approximately 8% without any sacrifice in indoor comfort, i.e. without a change in indoor temperature.

57263 **(DOE/R4/10437—T1) Retrofit catalytic converter for wood-burning stoves.** (Northern Kentucky Univ., Highland Heights (USA)). [nd]. Contract FG44-81R410437. 37p. NTIS, PC A03/MF A01. Order Number DE84000771.

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The major purpose of this project was to design, fabricate, test, and evaluate a retrofit catalytic converter for woodburning stoves. In the interim between our date of application March 5, 1981 and the beginning of the grant period December 1, 1981, several such devices became commercially available. Therefore, we decided to modify the purpose and direction of our project. In summary, we designed and constructed a calorimeter room in a building located on the campus of Northern Kentucky University. We equipped this room with a woodburning stove and a metal chimney extending through the roof. We designed and constructed the appropriate instrumentation for monitoring the heat output of the stove. We observed and recorded the operating characteristics of this stove over a period of several days. We then equipped the stove with a barometric damper and repeated the experiment. We are now in the process of equipping the stove with a catalytic converter. Thus the major emphasis of the project currently is to test and evaluate several commercial retrofit devices which are purported to reduce creosote and/or increase the efficiency of a woodburning stove.

57264 **(LBL—15636) Detailed examination of the LBL infiltration model using the Mobile Infiltration Test Unit.** Modera, M.P.; Sherman, M.H.; Levin, P.A. (Lawrence Berkeley Lab., CA (USA); Statens Raad foer Byggnadsforskning, Stockholm (Sweden)). Jul 1983. Contract AC03-76SF00098. 34p. (CONF-830640—9). NTIS, PC A03/MF A01. Order Number DE84000937.

From ASHRAE conference; Washington, DC, USA (26 Jun 1983).

The LBL infiltration model is a simplified method for combining weather information with air tightness to calculate residential air infiltration. In this report, we compare infiltration-model predictions with data collected by our Mobile Infiltration Test Unit (MITU), a full-scale test structure that gathers detailed weather and infiltration measurements. To probe for sources of prediction errors, we examine four simplifying assumptions made in the LBL infiltration model: 1) that the flow through the cracks in the building shell can be approximated by orifice flow, 2) that wind-induced and stack-induced infiltration can be represented in quadrature, 3) that wind-induced infiltration can be represented by averaging the valued for three typical aspect ratios, and 4) that wind-induced infiltration can be represented by averaging the values for all wind directions. We make comparisons with measured data to examine these effects qualitatively, and use detailed computer simulations of infiltration in MITU to quantify each effect. The effects of each assumption are represented by the bias and scatter. (The bias is the average error; the scatter is a measure of the ability of a model to track short-term fluctuations in infiltration rate.) We show that the orifice-flow assumption causes an 8% bias and a scatter of 20%, and that the quadrature assumption causes consistent overprediction (bias = 12%, scatter = 6%). For MITU, averaging over aspect ratio causes some ability of the model to track infiltration (scatter

= 14%). Although it reduces the ability of the model to track infiltration (scatter = 19%), averaging over wind direction has little effect on the mean infiltration rate (bias = 0). When compared to measured data, the LBL model has a bias of 10% and scatter of 28%.

57265 (NYSERDA—83-12) Daylighting demonstration. Final report. (Ehrenkrantz Group, New York (USA)). May 1983. Contract W-7405-ENG-48. 96p. NTIS, PC A05/MF A01. Order Number DE84001600.

Energy for lighting accounts for up to 50% of energy costs in commercial office buildings. The use of photoelectrically controlled dimming systems, which dim fluorescent lighting in response to the level of natural daylight in a space, provides a means for limiting this energy cost. This report documents a demonstration of three available dimming systems. Installation and monitoring of high performance lighting fixtures fitted with the three dimming control systems were undertaken in a midtown Manhattan office space. Feasibility/acceptability, energy consumption and economic implication issues are addressed.

57266 (ORNL/CON—80/R1) Oak Ridge heat-pump models. I. A steady-state computer design model for air-to-air heat pumps. Fischer, S.K.; Rice, C.K. (Oak Ridge National Lab., TN (USA)). Aug 1983. Contract W-7405-ENG-26. 186p. NTIS, PC E11/MF $5.00. Order Number DE84001577.

Includes 7 sheets of 48x reduction microfiche.

The ORNL Heat Pump Design Model is a FORTRAN-IV computer program to predict the steady-state performance of conventional, vapor compression, electrically-driven, air-to-air heat pumps in both heating and cooling modes. This model is intended to serve as an analytical design tool for use by heat pump manufacturers, consulting engineers, research institutions, and universities in studies directed toward the improvement of heat pump performance. The Heat Pump Design Model allows the user to specify: system operating conditions, compressor characteristics, refrigerant flow control devices, fin-and-tube heat exchanger parameters, fan and indoor duct characteristics, and any of ten refrigerants. The model will computer: system capacity and COP (or EER), compressor and fan motor power consumptions, coil outlet air dry- and wet-bulb temperatures, air- and refrigerant-side pressure drops, a summary of the refrigerant-side states throughout the cycle, and overall compressor efficiencies and heat exchanger effectiveness. Thorough documentation of how to use and/or modify the model is provided.

57267 (ORNL/CON—138) Process evaluation of the Bonneville Power Administration Residential Weatherization Pilot Program. Lerman, D.I.; Bronfman, B.H.; Tonn, B. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 83p. NTIS, PC A05/MF A01. Order Number DE84001579.

An evaluation of the BPA Residential Weatherization Pilot Program is described. Data for this report were gathered at the eleven public utilities participating in the program, at the BPA area and district offices serving these utilities, and at BPA headquarters. This process evaluation of the Pilot Program documents the history of the program, outlines the implementation strategies adopted by the Pilot utilities, describes the role of the BPA area and district offices in the program, and indicates what was learned by BPA and the utilities in the period the program operated.

57268 (ORNL/SUB—80-7800/1) Models of simultaneous heat and moisture transfer in soils. Fischer, R.D. (Battelle Columbus Labs., OH (USA)). Oct 1983. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE84001580.

Moisture migration in soils due to thermal effects is a phenomenon of interest to designers of ground-coupled heat-pump systems because of the concern about moisture migration away from buried pipes during cooling operation. Such moisture migration should have deleterious effects on heat transfer capabilities of the soil and, consequently, overall performance of the ground-coupled heat-pump system. A number of models for simultaneous heat and moisture transfer in soils have been identified; but, these models all have their origins in disciplines other than ground-coupled heat pumps. This report presents an evaluation of these models for application in modeling the performance of ground coupling during cooling operation. Two models are identified which may hold promise for modeling heat and moisture transfer in soils adjacent to horizontal ground coils of a ground-coupled heat pump during cooling operation. Recommendations are given as to the data and development that may be needed to bring these models to operational status for this particular application.

57269 (PNL—4873) Liability aspects of home energy-rating systems. Hendrickson, P.L. (Pacific Northwest Lab., Richland, WA (USA)). Oct 1983. Contract AC06-76RL01830. 68p. NTIS, PC A04/MF A01. Order Number DE84001634.

Liability aspects of home energy rating systems are discussed. An introduction to the rating system concept, including types of rating systems, implementation efforts to date, and possible groups to conduct ratings, is also included. The home energy rating system concept involves the periodic rating of the energy efficiency of residential buildings. The rating can provide a relative indication of a home's energy efficiency and also a quantitative estimate of consumption, fuel cost, or both. Primary attention is given to liability issues associated with developing and performing ratings. Secondary attention is given to possible liability associated with misuse of a rating once it has been performed.

57270 Energy-conservation mechanisms and potentials of landscape design to ameliorate building microclimates. Hutchison, B.A.; Taylor, F.G. *Landscape Journal;* 2: No. 1, 19-39(1983). Contract W-7405-ENG-26.

An assessment of the space-conditioning energy-conservation potentials of landscapes designed to ameliorate building microclimates is made. The physical bases for vegetative modifications of climate are discussed, and results of past studies concerning the effects of vegetation on space-conditioning energy consumption in buildings are reviewed. The state-of-the-art of energy-conserving landscape designs is assessed and recommendations for further research are presented. 92 references, 6 figures.

3202 Transportation

REFER ALSO TO CITATION(S) 57285

57271 (DOE/R4/10109—T1) Variable cam timing to improve gas mileage. Final report. (Cam Dyanmics, Inc., Memphis, TN (USA)). [nd]. Contract FG44-80R410109. 17p. NTIS, PC A02/MF A01. Order Number DE84000270.

Portions are illegible in microfiche products.

Recognizing that camshaft design in the modern automotive engine is at best a compromise for overall performance, Mark Heffington of Cam Dynamics, Inc. set out to maximize gas economy through the utilization of variable cam timing. The initial question was whether gasoline economy could be improved upon through varying the value timing over the operational range of an automotive engine. The testing procedure duplicated the load conditions that the automobile would be experiencing during operation. We tested gasoline consumption from IDLE up through 60 mph in 10 mph increments. Without question, variable valve timing is a realistic means for improving fuel economy in today's automobile. Further testing and development need to be done to work with the pollution controls which have an effect on the results. The camshaft retarder is an excellent device to alter the valve timing of the standard camshaft in order to achieve better fuel economy.

57272 (DOE/R4/10457—T1) EVOS-Sessio bicycle. Final technical report. Bradford, J.C. (Bradford (James C.), Conyers, GA (USA)). 1982. Contract FG44-81R410457. 13p. NTIS, PC A02/MF A01. Order Number DE84000798.

The EVOS-Sessio bicycle was introduced to the general public at the 1982 World's Fair in Knoxville, Tennessee on July 13, 1982. The grantee participated in the daily parade through the fairground. This event was chosen as the public introduction of this vehicle due to the fair's emphasis on energy technology and re-

sources. Sessio, Latin for sitting, was chosen as the name for the new generation of bicycle designed to be ridden in a comfortable seated position. This vehicle is designed to be more useful than a conventional bicycle through the incorporation of a covered cargo area, fairing, windscreen, weather-proof brakes, rechargeable Ni Cad lighting system and rearview mirrors. Jim Bradford, a bicycle maker for seven years, developed this new bicycle with the assistance of a grant from the Department of Energy, Appropriate Technology Program. Design studies and prototypes have been evolving since 1976; this grant enabled these to be fully explored and developed. The name EVOS is derived from evolutionary system, the philosophy of this design. This philosopy allows continual improvement and refinement as our needs and expectations change. The new shape and construction techniques will specifically allow an effective use of the materials of the space age in improving the most efficient vehicle Man has devised.

57273 **(N—8322179) Fuel conservation and economy constraints.** Barber, D.; Morrall, J.C. (Civil Aviation Authority, London (UK)). Feb 1983. 8p. NTIS, PC A06/MF A01.

In AGARD Air Traffic Control in Face of User's Demand and Econ. Constraints, 8 p (See N83-22177 12-04).

Fuel conservation in civil aviation may be achieved by increasing the efficiency of the aircraft themselves, by operating the aircraft more efficiently, and by providing them with a more efficient air traffic environment. Three aspects are discussed briefly, and possible improvements in the air traffic management environment are examined in more detail. Finally, attention is drawn to the research and development program needed to achieve fuel conservation by improved air traffic management.

3203 Industry And Agriculture

REFER ALSO TO CITATION(S) 56996, 56997, 56998, 57002, 57018, 57031, 57034, 57219

57274 **(CONF-810203—20) Dissolution and recovery of aluminum and other metals from Calsinter process sinter product.** Seeley, F.G.; Felker, L.K.; Kelmers, A.D. (Oak Ridge National Lab., TN (USA)). 1981. Contract W-7405-ENG-26. 25p. NTIS, PC A02/MF A01. Order Number DE83015512.

From AIME annual meeting; Chicago, IL, USA (22 Feb 1981).

In the Calsinter process for the recovery of aluminum and other metals, fly ash is sintered with a source of calcium oxide at 1000 to 1200°C, and the sinter product leached with dilute sulfuric acid. The leach step parameters have been optimized following a sinter of eastern Tennessee fly ash with limestone. Batch rate studies have shown that near maximum aluminum solubilization was achieved in 1 h at ambient temperature with 4N H_2SO_4 at 20% pulp density. A three-stage batch countercurrent leach system was operated under steady-state conditions in which only 2.2 moles of H_2SO_4 were required per mole of Al_2O_3 solubilized. Solubilization of aluminum (97%), iron (97%), titanium (82%), and a number of trace metals was obtained. Solvent extraction, employing a primary amine, removed 100% of the iron and 95% of several other metals present in significant concentration from the leach solution and rejected >90% of the aluminum. A cursory examination of the crystallization of ammonium alum from the solvent extraction raffinate showed product decontamination, with respect to Fe_2O_3, K_2O, MnO_2, and P_2O_5, to be excellent. Concentrations of CaO and Na_2O, however, were above specification limits.

57275 **(DOE/CS/40033—T5) Technology-impact study of the MTI high-efficiency industrial heat pump. Draft report.** Sullivan, D. (Hittman Associates, Inc., Columbia, MD (USA)). Mar 1979. Contract AC01-78CS40033. 111p. (H-C—193-009-79-776D). NTIS, PC A06/MF A01. Order Number DE84000144.

An analysis of a high-efficiency industrial heat pump which uses waste heat both as a heat source for the pump and to produce mechanical work which powers the entire system is presented. The heat pump is designed to recover industrial waste heat at approximately 200°F and to produce low-pressure steam. The overall heat flows through the system are shown. The basic findings of this study are: The system is feasible on technical grounds and does result in substantial energy savings where it can be used. System performance is highly dependent on the temperature of the waste heat available and the pressure at which steam is produced. The profitability of the prototype system is marginal at present although higher future fuel costs will increase the benefits of the device. Also, the case study installation has an exceptionally high first cost due to complicated piping and valving requirements. The system has the potential to save approximately 3 to 5 percent of total industrial energy nationally.

57276 **(DOE/R4/10085—T1) Energy-conserving perennial agriculture for marginal land in southern Appalachia. Final technical report.** Williams, G. (International Tree Crops Inst. U.S.A., Inc., Gravel Switch, KY. Appalachian Regional Office). 30 Jan 1982. Contract FG44-80R410085. 61p. NTIS, PC A04/MF A01. Order Number DE84000370.

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USDA economists predict the end of surplus farm production in the US within this decade. More and more marginal land will be cropped to provide feed for the growing world population and to produce energy. Much of this potential cropland in Southern Appalachia is poorly suited to annual crops, such as corn. Perennial crops are much better suited to steep, rocky, and wet sites. Research was undertaken on the theoretical potentials of perennial species with high predicted yields of protein, carbohydrates, or oils. Several candidate staple perennial crops for marginal land in Southern Appalachia were identified, and estimates were made of their yields, energy input requirements, and general suitabilities. Cropping systems incorporating honeylocust, persimmon, mulberry, jujube, and beech were compared with corn cropping systems. It appears that these candidate staple perennials show distinct advantages for energy conservation and environmental preservation. Detailed economic analyses must await actual demonstration trials, but preliminary indications for ethanol conversion systems with honeylocust are encouraging. It is suggested that short-term loans to farmers undertaking this new type of agriculture would be appropriate to solve cash-flow problems.

57277 **(N—8321502) Utilization of secondary energy resources at Magnitogorsk Metallurgical Combine.** Ermolaev, V.N.; Klyuvgant, V.I. (British Library, Boston Spa. Lending Div.). Dec 1982. 14p. Avail: British Library Lending Div., Boston Spa, Engl.

Transl. into English from Stal (USSR), V. 12, 1981, p 8-11.

Savings obtained by the use of secondary thermal and energy resources at Magnitogorsk Metallurgical Combine during the period of the 10th five year plan are reviewed. These savings were obtained by fuller utilization of these resources, e.g., fuel from the use of blast furnace and coke oven gases and steam from boiler utilizers and evaporative cooling systems. The savings achieved were substantial.

57278 **(PB—83-240606) Industrial energy use.** (Office of Technology Assessment (U.S. Congress), Washington, DC). Jun 1983. 185p. (OTA-E—198). NTIS, PC A09/MF A01.

The report examines energy use in the industrial sector in general and in the largest energy-using industries - pulp and paper, petroleum refining, chemicals, and steel - in detail. The report identifies the major technical opportunities available to each industry to improve energy efficiency, the barriers to implementation of such technologies, and the factors that guide corporate decisions about energy efficiency-improving investments. The policy options chosen for assessment were the effects of: (1) the accelerated cost recovery system of the 1981 Economic Recovery Tax Act, (2) investment tax credits for energy-conserving capital expenditures, (3) a tax on petroleum and natural gas, and (4) increased capital availability through lower interest rates.

57279 **(PB—83-243956) High temperature metallic recuperator. Annual report May 81-Dec 82.** Ward, M.E. (Solar Turbines, Inc., San Diego, CA (USA)). May 1983. 70p. (SR—83-R-4861-41). NTIS, PC A04/MF A01.

During this period, a high temperature metallic prototype recuperator was successfully tested in Solar Turbines Incorporated's

(Solar) research facilities. The prototype recuperator, sized to retrofit a 28 MM Btu/hr forge furnace, preheated combustion air to 1600°F with simulated 2000°F furnace flue gases. Also demonstrated in Solar's laboratory were commercially available special order burners capable of utilizing high temperature air. A field test recuperator system was designed to the selected field test furnace specifications based on the successful prototype configuration. The field test site is an open die forge shop, Pressform Company, located in Detroit. The recuperator for this field test along with all internally insulated ducting, was fabricated in Solar's ASME boiler code manufacturing facility. The furnace was designed and fabricated on-site by Pressform's personnel. The remainder of the system (burners, controls, valves, blowers, etc.) was supplied by North American Manufacturing Company.

57280 **(PB—83-244046) High-temperature ceramic recuperator and combustion air burner programs. Annual report Apr 82-Mar 83.** Coombs, M.; Strumpf, D. (AiResearch Mfg. Co., Torrance, CA (USA)). Apr 1983. 315p. NTIS, PC A14/MF A01.

The report describes the second-year effort of a 3-year program for the development of a ceramic recuperator and its companion high-temperature preheated combustion air burner. The system is designed to operate in a variety of industrial flue gas streams with exhaust temperatures up to 2500°F. The ceramic recuperator provides up to 2000°F preheated combustion air to the high-temperature burner. Under anticipated conditions, fuel savings of up to 50 percent are achieved when compared to unrecuperated furnaces.

57281 **Method for production of pig iron and an energy-rich gas.** Collin, P.H. Swedish Patent 8,007,225-9/B/. 15 Oct 1980. 9p. (In Swedish).

A method for production of pig iron and a high BTU gas to be used as fuel or synthesis gas. This method is of interest for sites where coal or electricity are available at low prices. Preheated, and pre-reduced, ore concentrate is introduced together with finely ground slag-forms (e.g. calcium carbonate, calcium oxide, quartz etc) into the plasma zone between the electrode and a pig iron bath in an electric arc furnace. Pulverized coal and, possibly, oxygen are injected into the bath. The furnace gas is cooled and washed and can be used for pre-reduction of the ore or as fuel or synthesis gas. The gas production is independent of the iron production, i.e. the gas production can by increased by increasing the coal and oxygen feed and reducing the electricity consumption.

3206 Municipalities And Community Systems

REFER ALSO TO CITATION(S) 56996, 56997, 56998, 57248, 57674

57282 **(AD-A—130445/0) Evaluation of Naval Station Mayport Heat Recovery Incinerator - October 1981 - June 1982. Final report Oct 81-Jun 82.** (VSE Corp., Oxnard, CA (USA)). Jun 1983. 39p. NTIS, PC A03/MF A01.

This report is the second report which addresses the long-term evaluation of the Mayport Heat Recovery Incinerator program. Operational data was collected from 29 Sep 1981 to 27 Jun 1982 and then analyzed for reliability, availability, maintainability, thermal efficiency, and operating cost.

57283 **(ANL/CNSV—39) Energy from municipal waste: assessment of control technologies for stack-gas emissions.** Helt, J.E.; Myles, K.M. (Argonne National Lab., IL (USA)). Sep 1983. Contract W-31-109-ENG-38. 97p. NTIS, PC A05/MF A01. Order Number DE84001516.

Recovery of materials and energy from municipal solid waste (MSW) is becoming increasingly popular, with the number and types of combustors still increasing. The environmental impact of the energy-from-municipal-waste (EMW) processes is still questionable. Stack-gas emissions of concern, identifies to what extent the emissions have been monitored, and describes present and potential future control technologies for EMW facilities.

57284 **(DOE/R4/10084—T1) Waste not - want not. DOE appropriate technology small grants program.** (Mountain Community Workshop, Berea, KY (USA)). 1981. Contract FG44-80R410084. 77p. NTIS, PC A05/MF A01. Order Number DE84000371.

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The work reported was to look at various alternatives for local solid waste management and develop an implementation strategy for a resource conservation and recovery plan for the community of Berea, Kentucky. A library on recycling and conservation of resources was compiled, and state and local plans were examined. To get a better understanding of how the community would respond to a waste reduction and recycling program, a series of surveys was conducted. A community recycling project plan is proposed. (LEW)

3209 Education And Public Relations

57285 **(DOE/R4/10288—T1) Biking to work in Miami. Final technical report.** Kerr, O. (Kerr (Oliver), Miami, FL (USA)). Aug 1982. Contract FG44-80R410288. 54p. NTIS, PC A04/MF A01. Order Number DE84000753.

The objective of the project was to produce and distribute a guide to commuting by bicycle in the Miami metropolitan area. The area is uniquely suited to bicycling because of its pleasant year-round climate and relatively flat topography. Persuading even a small percentage of automobile commuters to try biking to work could result in substantial energy savings in Miami as in most other major metropolitan areas. Seven of the largest employment centers in the area were selected as major commuter destinations suitable for bicycle commuters. Safe and scenic ways of commuting to these areas by bicycle were mapped and described in a series of short narratives. Additional material on safe riding techniques and the choice of equipment was developed. The resulting 40 page booklet, Biking to Work in Miami, was printed and distributed by the author to local cycling groups, bicycle interests, and others. Copies were also sent to interested parties outside the Miami area. The initial reception has been very encouraging and a number of favorable reply cards have been received with useful comments and suggestions. A revised version aimed at stimulating bikers to avail of the soon-to-be-opened rapid transit system is being considered. A writer for the Miami Herald is interested in using parts of the Guide for a series in the newspaper.

57286 **(DOE/R5/10322—3) Do-it-yourself home-savings-techniques program. Final report, September 25, 1981-June 30, 1983.** Halasa, O.; Benjamin, R.; Deininger, L. (Cleveland Public Schools, OH (USA). Dept. of Research and Analysis). Jun 1983. Contract FG02-81R510322. 48p. NTIS, PC A03/MF A01. Order Number DE84001598.

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The Do-It-Yourself Home Savings Techniques, under the US Department of Energy funding, was designed to develop and test an instructional unit and related instructional materials for making homes energy efficient. The project was implemented at eleven schools in the Cleveland City School District during the period October 1981 through February 1983. Estimated federal costs amounted to $28,471. Eleven Science teachers and about 1200 students were involved in the project. As a result of the favorable assessment of this project by staff, students and parents, plans are being made to integrate the Energy instructional unit with the Physical Science scope and sequence for the 1983-1984 school year. Key project accomplishments are noted: development of curriculum guide, Do-It-Yourself Energy Guide, consisting of nine Energy lessons; assembling of materials required by the instructional activities of the Energy lessons; and provision of periodic inservice workshops for participating teachers to help teach Energy lessons. Evaluation of the project operations indicated it was effective in developing and pilot-testing an instructional unit and related materials on energy. Ratings of the Energy instructional unit by students, staff and parents were markedly favorable.

33 ADVANCED AUTOMOTIVE PROPULSION SYSTEMS

3301 Internal Combustion Engines

REFER ALSO TO CITATION(S) 57289

57287 (CONF-810299—, pp 209-211) **Ford Tractor Operations alcohol program.** McLean, D.H. Mar 1981. NTIS MF A01.

From DOE alcohol fuel conference; Boise, ID, USA (13 Feb 1981).

In order to reduce the use of diesel fuel in agricultural tractors, the Brazilian government entered into agreement with Ford Tractor Operations of Brazil (FTO). FTO was to build ten prototype tractors which EMBRAPA (the research group of the Brazilian agricultural ministry) would field test at a variety of locations in Brazil. Gasoline spark ignition engines were converted to use 100% ethanol fuel. Two engines were made: a 3-cylinder 201 in.^{3} for use in the 4600 tractor and a 4-cylinder 256 in.^{3} engine for the 6600 tractor. The performance tests of the engines showed that the alcohol engine will consume one and one-half times the amount of fuel as the diesel engine, but when corrected for the Btu content of the fuel, the alcohol engine is slightly more efficient. During field testing, only minor malfunctions occurred. FTO has continued development in several areas where improvement is needed. (CKK)

3303 Electric-powered Systems

REFER ALSO TO CITATION(S) 57288

3304 Hybrid Systems

57288 **(DOE/R4/10448—T1) Electric-car range extension through hybrid modification. Final report.** (Alternate Energy Associates, Inc., Tucker, GA (USA)). 30 Jun 1982. Contract FG44-81R410448. 9p. NTIS, PC A02/MF A01. Order Number DE84000396.

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A gasohol powered generator set has been installed on a 1210 pound electrically powered Citicar. A power supply has been designed to convert the alternating current of the generator to run the car at a level of 36 vdc maximum. This is less than the 48 vdc used by the Citicar battery pack but which greatly exceeds the ratings on the 3.5 hp General Electric motor. Tests were done to see the minimum stepping voltage to give smooth acceleration and this was found to be 18 vdc. Tests with the generator-power supply set showed a level path consumption of 35 to 40 mpg. Switching between the generator and battery supplies is accomplished manually. The conclusion is that hybridization can be accomplished fairly reasonably but much needs to be done on the development of the electric car itself and particularly battery systems.

3308 Alternative Fuels

REFER ALSO TO CITATION(S) 57287

57289 **(DOE/BC/10114—12) Residual shale-oil/diesel-engine operating compatibility program. Final report.** Burnett, M.; Derbidge, C.; Kuby, W.; Niven, H.; Richard, R. (Acurex Corp., Mountain View, CA (USA); Ricardo Consulting Engineers Ltd., Shoreham-by-Sea (UK)). Oct 1983. Contract AC19-80BC10114. 126p. NTIS, PC A07/MF A01. Order Number DE84000133.

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As part of a DOE study to determine the effective utilization of alternate fuels in medium-speed diesel engines, a residual shale oil (RSO) was fired in an APE-Allen, 1000-rpm, 9.5-in. bore diesel engine. Various fuel injection modes were considered. Based on a fuel characterization study and go/no-go tests, it was determined that the direct firing of 100 percent RSO gave performance comparable with that using No. 2 diesel fuel; consequently, performance/endurance tests were performed using 100 percent RSO. Conclusions of this test program are: Laboratory tests showed low levels of corrosion and deposit-causing elements. Therefore, corrosion and wear of engine components, when using RSO, should be no worse than for standard diesel fuel. The high wax content of RSO requires heating for supply, handling, and injection systems. Laboratory tests showed that the cetane number of RSO was equivalent to No. 2 diesel; hence, no engine modifications should be needed to burn RSO. The engine performance on RSO was essentially similar to standard diesel fuel. The thermal efficiency was slightly lower and Bosch smoke and particulates were slightly higher, especially at low load. Soft carbon deposits, formed on injectors when using RSO, did not affect performance. The 115-hour endurance test showed no significant performance deterioration. The deposit accumulation in combustion chambers and ports was not severe but was greater than standard diesel fuel would produce. Longer endurance tests are required to fully establish this conclusion. 41 figures, 21 tables.

57290 **(DOE/R4/10223—T1) Use of alcohol fuel: engine-conversion demonstration. Final report.** Marsh, W.K. (ed.). (South Carolina Dept. of Parks, Recreation and Tourism, Columbia (USA)). 1982. Contract FG44-80R410223. 45p. NTIS, PC A03/MF A01. Order Number DE84000405.

The use of ethanol as a fuel extender when mixed with gasoline, and the use of both hydrated and anhydrous ethanol as a fuel in gasoline and diesel engines are discussed. Required engine modifications for efficient use of ethanol are described, and include engine compression alterations, carburetor adjustments, and arrangement for fuel preheating. In 1981 and 1982 a demonstration of ethanol use in spark ignition engines was conducted at a major public park in South Carolina. The demonstration included a controlled road test with a pick-up truck and a demonstration of ethanol use in small, air cooled gasoline engines. One problem that was identified was that of contaminated fuel that clogged the fuel system after a few days' operation. (LEW)

36 MATERIALS

REFER ALSO TO CITATION(S) 56836

57291 **(KFK—3512-B) General and special engineering materials science. Vol. 1.** Ondracek, G.; Voehringer, O. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung - Inst. fuer Werkstoffkunde 2). Apr 1983. 591p. NTIS (US Sales Only), PC A25/MF A01. Order Number DE83751288.

(In Spanish).

The present report about general and special engineering materials science is the result of lectures given by the authors in two terms in 1982 at Instituto Balseiro, San Carlos de Bariloche, the graduated college of the Universidad de Cuyo and Comision Nacional de Energia Atomica, Republica Argentina. These lectures were organised in the frame of the project "nuclear engineering" (ARG/78/020) of the United Nations Development Program (UNDP) by the International Atomic Energy Agency (IAEA). Some chapters of the report are written in English, others in Spaniah. The report is subdivided into three volumes: Volume I treats general engineering materials science in 4 capital chapters on the structure of materials, the properties of materials, materials technology and materials testing and investigation supplemented by a selected detailed chapter about elasticity plasticity and rupture mechanics. Volume II concerns special engineering materials science with respect to nuclear materials under normal reactor operation conditions including reactor clad and structural materials, nuclear fuels and fuel elements and nuclear waste as a materials viewpoint. Volume III - also concerning special engineering materials science - considers nuclear materials with respect to off-normal ("accident") reactor operation conditions including nuclear materials in loss-of-coolant accidents and nuclear materials in core melt accidents.

57292 (UCRL—89299) Vacuum outgassing of various materials. Erikson, E.D.; Beat, T.G.; Berger, D.D.; Frazier, B.A. (Lawrence Livermore National Lab., CA (USA)). 28 Sep 1983. Contract W-7405-ENG-48. 27p. (CONF-831011—3). NTIS, PC A03/MF A01. Order Number DE84001449.

From American Vacuum Society symposium; Boston, MA, USA (31 Oct 1983).

A gas analytical system for measuring the evolved gases from materials during vacuum degassing is discussed. The outgassing data are based upon the throughput measurement and a computer-controlled quadrupole mass spectrometer allows the determination of residual gas species. A variety of materials have been tested in the as received condition at room-temperature vacuum exposure. Test results are presented for some unusual materials such as chlorinated polyvinyl chloride (CPVC), low-density carbon foam and Monel knitted wire mesh (both of which could be used for the attenuation of electromagnetic or radio frequency interference), polyethylene (in the form of black pipe, various thicknesses of sheet, or as an electrostatically applied coating to metal substrates), as well as Parylene-N conformal coatings applied to either CPVC, polyethylene, or stainless steel substrates.

3601 Metals And Alloys

REFER ALSO TO CITATION(S) 56829, 56835, 56841, 56842, 57003, 57132, 57514, 57517, 57796, 57965

57293 (CEA-CONF—6588) Probabilistic evaluation of fatigue crack growth in SA 508 and SA 533 B steel. Dufresne, J.; Rieunier, J.B. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). Jul 1982. 26p. (CONF-820601—33; DSN—562). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703716.

From ASME pressure vessel and piping conference; Orlando, FL, USA (27 Jun 1982).

This paper describes the method used to select the best representative law of fatigue crack growth in view of its introduction in a probabilistic computer code. A modelling of the selected law (Paris law) and the statistical distribution of the corresponding numerical coefficients are presented. Results of computation are given in the case of a PWR pressure vessel with defects in belt line weld.

57294 (CONF-830942—18) Microstructure and bend ductility of a $(Fe,Ni)_3V$ ordered alloy irradiated in HFIR. Braski, D.N. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE84000716.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Disks of a $(Fe,Ni)_3V$ long-range-ordered alloy were irradiated in the High Flux Isotope Reactor to 10, 21, and 42 dpa and helium levels of 1000, 2700, and 6000 at. ppM, respectively. The irradiation temperatures were 300, 400, 500, and 600°C. The alloy remained ordered under all conditions. Swelling of the alloy was low with a peak of 1.3% occurring at 500°C. Severe embrittlement and intergranular fracture occurred after 10 dpa at 600°C and extended to lower temperatures as the damage level increased. Helium bubbles and a thin, continuous film of VC observed in the grain boundaries may be the cause of the embrittlement.

57295 (CONF-830942—19) Effect of phosphorus on the swelling and precipitation behavior of austenitic stainless steels during irradiation. Lee, E.H.; Mansur, L.K.; Rowcliffe, A.F. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 8p. NTIS, PC A02/MF A01. Order Number DE84000412.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

It has been observed that increasing the volume fraction of the needle-shaped iron phosphide phase in austenitic stainless steels tends to inhibit void swelling during neutron irradiation. An earlier analysis showed that this effect could not be accounted for in terms of enhanced point defect recombination at particle-matrix interfaces. The behavior of the iron phosphide phase has been further examined using dual ion beam irradiations. It was found that the particle-matrix interface serves as a site for the nucleation of a very fine dispersion of helium bubbles. It is thought that since a high number density of cavities lowers the number of helium atoms per cavity, the irradiation time for the cavities to accumulate the critical number of gas atoms for bias-driven growth is correspondingly increased. Although the phosphide phase nucleates rapidly, it eventually undergoes dissolution if either the G or Laves phase develops with increasing dose.

57296 (DOE/ER/10107—17) Irradiation response in titanium-modified austenitic stainless steels prepared by rapid-solidification processing. Part I. Microstructural response to neutron irradiation. Imeson, D.; Lee, M.; Vander Sande, J.B.; Grant, N.J.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1983. Contract AC02-78ER10107. 5p. (CONF-830942—43). NTIS, PC A02/MF A01. Order Number DE84001298.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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The neutron irradiation response of cold worked Path A PCA has been investigated to about 34 dpa (3100 appm He). Cavity formation can be limited solely to helium accommodation in bubbles under certain circumstances, that is, with bias driven swelling completely suppressed. Under other conditions, however, similar behavior to that of type 316 steel is observed. The differences are strongly correlated with differences in the initial distribution of titanium carbide particles and their precipitation and/or recoil-induced dissolution under irradiation. The effects of rapid solidification processing are explored.

57297 (DOE/ER/10107—18) Irradiation response in titanium-modified austenitic stainless steels prepared by rapid-solidification processing. Part II. Dual-ion irradiations. Tong, C.H.; Imeson, D.; Vander Sande, J.B.; Grant, N.J.; Harling, O.K.; Megusar, J. (Massachusetts Inst. of Tech., Cambridge (USA)). 1983. Contract AC02-78ER10107. 5p. (CONF-830942—44). NTIS, PC A02/MF A01. Order Number DE84001297.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Dual-ion irradiations have been performed on Path A PCA and other alloys with increased titanium and carbon content, prepared by rapid-solidification processing. Comparison with the neutron response shows many points of similarity. The effect of the amount of Ti and C included, and its initial distribution, is investigated, as is the difference between fully processed material, including consolidation by hot-extrusion, and the as-rapidly-solidified alloy. It is shown that increased TiC content can be effective in controlling swelling both directly, and by increasing the microstructural stability.

57298 (DOE/ER/10107—19) Irradiation response in titanium-modified austenitic stainless steels prepared by rapid-solidification processing. Part III. A model for the effect of titanium addition. Imeson, D.; Tong, C.H.; Parker, C.A.; Vander Sande, J.B.; Grant, N.J.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1983. Contract AC02-78ER10107. 5p. (CONF-830942—42). NTIS, PC A02/MF A01. Order Number DE84001296.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Titanium carbide precipitation on dislocations during irradiation and recoil-induced particle dissolution are considered. The outline analysis given indicates that complete swelling suppression may occur in favorable conditions due to a counterbalancing of the effective dislocation interstitial bias. The behavior is, however, not stable against a return to normal swelling levels for type 316 steels. The model presented is able to account for the diverse experimentally observed irradiation response.

57299 **(DOE/ER/10107—20) Minaturized disk bend tests of neutron-irradiated path A type alloys.** Lee, M.; Sohn, D.S.; Grant, N.J.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA)). 1983. Contract AC02-78ER10107. 5p. (CONF-830942—41). NTIS, PC A02/MF A01. Order Number DE84001277.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Path A Prime Candidate Alloy (PCA) has been rapidly solidified and consoliated by extrusion. Twenty percent CW samples, precision TEM disks, 3 phi x 0.254 mm, were irradiated in the mixed flux of the Oak Ridge HFIR reactor up to ~ 8.5 dpa (360 appm He) and ~ 34 dpa (3100 appm He) at 300, 400, 500 and 600°C. Similar samples of conventionally processed PCA were also irradiated for comparison. Mechanical properties were characterized using a minaturized disk bend test (MDBT) developed at MIT. These tests indicate major decreases in strength and ductility especially for the 500 and 600°C irradiations. No major differences were found between this first version of a rapidly solidified and extruded PCA type alloy and conventionally processed PCA.

57300 **(DOE/ER/10461—T1) Far infrared studies on superconductors and heat-capacity studies on liquid crystals. Final report.** Huang, C.C. (Minnesota Univ., Minneapolis (USA). School of Physics and Astronomy). 15 Sep 1983. Contract AC02-79ER10461. 14p. NTIS, PC A02/MF A01. Order Number DE84001105.

The status of three different projects is described. First, low temperature ($2.6\ K < T < 30\ K$) heat-capacity measurements on one transforming V_3Si sample show that the electronic heat capacity in the superconducting state is well characterized by the weak-coupling BCS theory. Secondly, preliminary characterization of one doped ^{3}He-cooled-Ge-bolometer for far infrared radiation gave resistance $\simeq 3 \times 10^6\ \Omega$ and sensitivity $\simeq 1 \times 10^6$ V/W at 0.43 K. This is comparable with the existing best reported values. Finally, one quasi-adiabatic calorimeter with high resolution and versatility has been built for studying phase transitions between the mesophases in liquid crystals which have low thermal conductivity. Heat-capacity studies have been carried out in two important continuous phase transitions, i.e., smectic A (SmA) - hexatic B and SmA - smectic C (SmC). A phase with hexatic type of ordering was first found in one liquid crystal mesophase, i.e., hexatic B. Unfortunately our results on the continuous SmA -hexatic B transition lead to large critical exponents associated with heat capacity anomaly and cannot be explained by the existing theories. On the other hand, our results on one continuous SmA-SmC transition indicated the importance of retaining sixth order in the mean-field Landau free energy expansion. Our observation resolves many controversial conclusions related to the nature of SmA-SmC transition. 16 references.

57301 **(DOE/ET/10747—T1) Analysis of hydrogen attack on pressure-vessel steels. Final report.** Odette, G.R. (California Univ., Santa Barbara (USA). Dept. of Chemical and Nuclear Engineering). 1982. Contract AS05-78ET10747. 49p. NTIS, PC A03/MF A01. Order Number DE84000061.

This paper reviews the existing data on hydrogen attack in 2 1/4 Cr-1 Mo alloys and presents a model of methane-pressure-induced cavity nucleation and growth kinetics. The model is based on creep-constrained growth of cavities, nucleated on preexisting sites driven by methane at a pressure controlled by the least-stable carbide species present. It provides a qualitative explanation of most experimental observations by describing the interplay between several kinetic and thermodynamic processes as governed by various metallurgical features, e.g., carbides, grain-boundary microstructure and creep strength. The model predicts the temperature and pressure dependence of hydrogen-attack-induced swelling data. These data are used to calibrate the model for several alloy conditions; the quantitative models are used to evaluate the potential influence of critical variables, including applied stress. It appears that given proper metallurgical practice, 2 1/4 Cr-1 Mo alloys can be safely used for liquefaction pressure vessels. However, there are substantial areas of uncertainty in this assessment; and the required metallurgical practice may involve substantial penalties.

57302 **(DOE/ET/52027—7) Suppression of blistering in a broadly distributed ion implantation under simulated fusion first-wall conditions.** Kohse, G.; Harling, O.K. (Massachusetts Inst. of Tech., Cambridge (USA). Nuclear Reactor Lab.). 1983. Contract AC02-78ET52027. 4p. (CONF-830942—45). NTIS, PC A02/MF A01. Order Number DE84001299.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Stainless steel specimens have been irradiated with He and Li ions having a broad distribution of energy and angle of incidence. Maximum penetration was ~ 2.5 μm (He ions). During the ion bombardment the samples were also exposed to fast neutrons and cyclic temperatures and stresses. For ions fluences up to $\sim 1 \times 10^{22}$ ions/m^2 under these conditions, almost no blistering is observed on a scale detectable by SEM. Observation of carefully prepared cross-sections indicates that the ion damaged region remains coherent with the bulk material. These results for ion implantations provide some basis for optimism concerning suppression of blistering in fusion reactors.

57303 **(EGG-M—18083) Tensile and low-cycle fatigue measurements on cross-rolled tungsten at 1505 K.** Schmunk, R.E.; Korth, G.E.; Ulrickson, M. (EG and G Idaho, Inc., Idaho Falls (USA); Princeton Univ., NJ (USA). Plasma Physics Lab.). 1983. Contract AC07-76ID01570. 5p. (CONF-830942—31). NTIS, PC A02/MF A01. Order Number DE84000805.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Tungsten continues to be considered for use in fusion reactors because of its mechanical properties, good thermal shock resistance, and relatively high thermal conductivity. Low-cycle fatigue and tensile tests have been made at 1505 K on specimens fabricated from 12.7-mm thick cross-rolled tungsten plate which was prepared by a powder metallurgy process. All tests were made in vacuum, and the fatigue tests were made in strain control. The experimental fatigue data agree fairly well with the universal slopes equation, giving a slightly lower number of cycles to fail than predicted by the equation for a given strain range. Details of the test procedure are reported along with the experimental results. These data should support continued design work where tungsten is considered for application in pulsed reactor systems.

57304 **(EUR—7796) Comparison among creep rupture strength extrapolation methods with application to data for AISI 316 SS from Italy, France, U.K. and F.R.G.** Brunori, G.; Cappellato, S.; Vacchiano, S.; Guglielmi, F. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 148p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703717.

Inside Activity 3 "Materials" of WGCS, the member states UK and FRG have developed a work regarding extrapolation methods for creep data. This work has been done by comparising extrapolation methods in use in their countries by applying them to creep rupture strength data on AISI 316 SS obtained in UK and FRG. This work has been issued on April 1978 and the Community has dealed it to all Activity 3 Members. Italy, in the figure of NIRA S.p.A., has received, from the European Community a contract to extend the work to Italian and French data, using extrapolation methods currently in use in Italy. The work should deal with the following points: - Collect of Italian experimental data; - Chemical analysis on Italian Specimen; - Comparison among Italian experimental data with French, FRG and UK data; - Description of extrapolation methods in use in Italy; - Application of these extrapolation methods to Italian, French, British and Germany data; - Extensions of a Final Report.

57305 **(EUR—7797) Comparative study of the tensile properties of type 316 steel.** Wood, D.S.; Brunori, G.; Heesen, E.T.; Petrequin, P. (Commission of the European Communities, Luxembourg. Center for Information and Documentation). 1982. 33p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703718.

The elevated temperature tensile properties data on Type 316 steel from France, Germany, Italy and the UK have been evaluated and compared over the temperature range RT-700°C. No significant differences in average properties were found but the lower confidence limits of the French data were significantly higher than those obtained from the other countries. The superior minimum properties of the French steel are attributed to the smaller spread in the data brought about by its narrow specification.

57306 **(EUR—7821) Small angle neutron scattering study of the damage induced by creep deformation in AISI 304 stainless steel.** Boeuf, A.; Coppola, R.; Matera, R.; Rustichelli, F.; Zambonardi, F.; Puliti, P.; Melone, S. (Commission of the European Communities, Ispra (Italy). Joint Research Centre). 1982. 97p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703719.

In the austenitic stainless steels, a class of materials largely used in the nuclear power plants, creep induces essentially two new microstructural effects: the nucleation and growth of grain boundary cavities and the precipitation of carbides. Carbides precipitate as a consequence of pure thermal treatment, whereas for the occurrence of voids the presence of stress is necessary. It should be noted however, that the kinetics of precipitation and even the precipitate crystal structure are changed by the introduction of dislocations due to straining during creep. The aim of the present study is a quantitative characterization of the creep damage occurring in a stainless steel of the type X 6 CrNi 8 11 (AISI 304). The experimental techniques used are optical and electron microscopy, microprobe analysis and small angle neutron scattering. This latter technique is described in more detail.

57307 (EUR—7835-EN, pp A1-A38) **Choice of materials for corrosive conditions in oil and gas production, in particular for the prevention of H_2S stress corrosion (sour corrosion).** Groenewoud, K. 1983. Commission of the European Communities, Luxembourg.

In Low enthalpy geothermal process materials selection, corrosion prevention and scaling problems.

This contribution is part of the NAM report NAM T.M. 3471 of the same title. It is presented in the publication at hand as annex I, because only a very limited number of low-enthalpy geothermal plants have been operated so far for a sufficiently long time so that reliable material data could have been obtained. Conditions comparable to these in geothermal plants occur also in the oil and gas industry. Thus experience gained in this branch can be used as information source for geothermal process equipment.

57308 **(EUR—8242-EN) European concerted action - COST 50 - materials for gas turbines.** Lang, E.; Bullock, E. (Commission of the European Communities, Luxembourg). 1982. 154p. Commission of the European Communities, Luxembourg.

The current project examines the interaction between coating and substrates during long-term exposure to high temperature, with emphasis on the structural alteration of the substrate alloys by the coating or the coating application process and its consequent effect on mechanical properties relevant to gas turbine operation, creep and thermal fatigue. The project considers two typical gas turbine blading alloys, and a range of coatings applied by a variety of processes, including simple and complex aluminides, and overlay coatings of the MCrAlY-type.

57309 **(FEI—1293) Investigation of zirconium 95 diffusion in monocrystalline molybdenum.** Korolev, A.A. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Obninsk. Fiziko-Ehnergeticheskij Inst.). 1982. 9p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703720.

Impurity diffusion of zirconium 95 in monocrystalline molybdenum in the temperature range of 1700 to 2030 deg C is investigated and the equation of temperature dependence of diffusion coefficients id obtained. It is shown that parameters of the temperature dependence correlate well with concepts of a vacancy diffusion mechanism. Peculiarities of diffusion investigation technique with the use of radioactive isotopes are discussed when a diffusant contains impurities of a β-radioactive element.

57310 **(FhG-W—7/81) Mechanical behaviour of defects in metallic materials.** Kordisch, H. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Freiburg im Breisgau (Germany, F.R.). Inst. fuer Werkstoffmechanik). Dec 1981. 47p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751147.

With 29 figs., 5 tabs. and 32 refs.

In first approximation three error models are defined in a test disk for the simulation of arbitrary defects in a mechanical device: a circular cavity, a circular rigid inclusion, and a crack of equivalent surface. Individual defects and two adjacent defects are treated. Based on the method of finite elements and realistic material constants, the stresses in the device are calculated in the limits of a plane stress state, a plane strain state, a rotationally symmetric state, and a three-dimensional model. For the material behaviour linear elasticity and elastoplasticity are considered up to the limiting stresses. The results are used to estimate possible maximum stress limits for different hypothesis of failure.

57311 (HMI-B—370, pp 116-122) **Combined analysis of structure factors and Compton profile measurements on beryllium single crystals.** Larsen, F.K.; Hansen, N.K.; Schneider, J.R. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The structure factors obtained for Beryllium single crystals by X-ray diffraction, neutron diffraction and Compton profile measurements are compared. A difference of about 7% is found.

57312 (HMI-B—370, pp 123-128) **Compton scattering study in copper single crystals.** Pattison, P.; Hansen, N.K.; Schneider, J.R. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

Compton scattering measurements are performed for copper single crystals. The quality of analysing the electronic structure is discussed, especially the Fourier transform of the momentum density.

57313 (HMI-B—370, pp 132-136) **Rotational motion and incoherent scattering function of the OH^--group in the cubic rotator phase of NaOH.** Kettner, C.; Lechner, R.E.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The details of the rotational motion of the OH^--group in the cubic high-temperature phase (567 K<T<594 K) of NaOH are investigated by neutron diffraction. A model is developed in order to estimate the phonon density of states from time-of-flight spectra.

57314 (HMI-B—370, pp 137-140) **Dynamics of the NH_4^+-ion in phase I of NH_4I.** Stahn, M.; Lechner, R.E.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The NaCl-type high-temperature phase of NNsub(H)I is studied, where each NH_4^+-tetrahedron occupies the center of an octahedron formed by its next I^--neighbours. In order to study the rotation of the NH_4^+-ions incoherent neutron time-of-flight spectra are performed.

57315 (HMI-B—370, pp 163-164) **Texture investigations on steels by neutron diffraction.** Bunge, H.J.; Welch, P.I.; Graf, H.A. Jan 1982. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57316 **(INIS-BR—18) Anodic behavior of AISI 304 stainless steel in chlorine solutions: the effect of various parameters.** Bender, I.; Mueller, I.L. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Programa de Pos-graduacao em Engenharia Metalurgica e dos Materiais). 1981. 10p. (In Portuguese). (CONF-8106271—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781102.

From 8. national seminar of corrosion; Rio de Janeiro, Brazil (10 Jun 1981).

The effect of various parameters on the ocurring of different types of corrosion in the stainless steel AISI-304 at different conditions of thermal treatment is discussed.

57317 **(INIS-BR—19) Corrosion and superficial states of niobium. Part 2.** Joanni, E.; D'Alkaine, C.V.; Bulhoes, L.O.S. (Sao Carlos Univ. (Brazil). Dept. de Quimica). 1981. 11p. (In Portuguese). (CONF-8106271—3-Pt.2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781103.

From 8. national seminar of corrosion; Rio de Janeiro, Brazil (10 Jun 1981).

The influence of the anion in the formation of superficial states of niobium are analysed. The results are interpreted, investigating the behavior of niobium in sodium sulfate solutions.

57318 **(INIS-BR—21) Adaptation of a thermo assay balance to the study of oxidation by water vapor and/or oxygen at high temperatures.** Uller, L.; Santarini, G.; Dixmier, J.; Coriou, H. (Fundacao de Tecnologia Industrial, Rio de Janeiro (Brazil)). 1981. 14p. (In Portuguese). (CONF-8106271—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781105.

From 8. national seminar of corrosion; Rio de Janeiro, Brazil (10 Jun 1981).

The construction of an apparatus which allows the continuous follow-up of oxidation in the presence of steam, with different addition of O_2 is described. This apparatus permits one to observe the initial kinetics of oxidation of the stainless steel type 18-10 in mixtures steam/oxygen.

57319 **(INIS-BR—25) Study of the stress corrosion cracking susceptibility of type 304 austenitic stainless steel in aqueous solution of $MgCl_2$ at 125°C using the slow-strain-rate technique.** Heck, N.C. (Rio Grande do Sul Univ., Porto Alegre (Brazil). Escola de Engenharia). 1981. 124p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781106.

A study has been made of the stress corrosion cracking susceptibility of type 304 austenitic stainless steel mainly in aqueous solution of $MgCl_2$ at 125°C using the slow strain-rate technique. A system is built up of a tensile test machine and the peripheric equipment. The efficacy of this system has been tested by running experiments for determination of critical potentials in $MgCl_2$ with or without aditions of $NaNO_3$. Critical potentials are found to be between -145 and -160 mV sub(H) for pure $MgCl_2$ and between -90 and -100 mV sub(H) for $MgCl_2$ plus 2,5% $NaNO_3$. Comparing these results with others of constant load tests, good agreement is found.

57320 **(INIS-BR—37) Oxidation kinetics of Zircaloy-4 under isothermal conditions.** dos Santos, A.M.M.; Cardoso, P.E. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1982. 11p. (In Portuguese). (CONF-821248—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781110.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The oxidation kinetics of zircaloy-4 tubes was studied by means of isothermal tests in the temperature interval 500°C to 900°C. Dry oxygen and water steam, were used as oxidant agents. The results show that the oxidation kinetics law exhibits a behaviour from cubic to parabolic in the range of the time and temperatures of the experiment. Dry oxygen shows a stronger oxidation effect than water steam. A special mechanical test to study the embrittlement effect in the small samples of zircaloy tubes was used.

57321 **(INIS-BR—38) Modifications on the behaviour of AISI 304 stainless steel submitted to creep caused by intermediate treatment of annealing.** Barreto, L.F.P.; Monteiro, S.N.; da Silveira, T.L. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1982. 16p. (In Portuguese). (CONF-821248—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781111.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Type AISI 304 austenitic stainless steel samples which have been previously creep deformed at 750°C, were annealed at 1100°C. The effects of this heat treatment in the mechanical behavior of this material when retested in creep were investigated. The results were analysed by taking into account the structural modifications observed and the controlling mechanisms which operate during the deformation and fracture occurring in the creep process.

57322 **(INIS-BR—40) Ultra-sonic observation in niobium hydride precipitation.** Florencio, O.; Pinatti, D.G. (Universidade Estadual de Maringa (Brazil). Dept. de Fisica; Sao Carlos Univ. (Brazil). Dept. de Engenharia de Materiais). 1982. 11p. (In Portuguese). (CONF-821248—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781112.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The hydrogen embrittlement of exothermic ocluders, had been considered as due to applied stress induced hydride precipitates leading to brittle fracture. The results of simultaneous measurements of macroscopic deformation and elastic change due to hydride precipitation, using the ultrasonic pulse-echo technique are shown. Then the possibility of kinetic precipitation parameters evaluation was tested.

57323 **(INIS-BR—41) Effect of previous treatment on Nb and Nb-1%Zr alloys oxidation under 800°C.** Schilling, O.F.; Assuncao, F.C.R. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Ciencia dos Materiais e Metalurgia). 1982. 11p. (In Portuguese). (CONF-821248—6). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781113.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Protective oxide scales were grown on niobium and Nb-1%Zr alloys under selected treatment conditions. The variables used to promote the different conditions were the temperature, the atmosphere of treatment and the surface finishing. After metallographic and crystallographic characterization of the oxide scales, the specimens were oxidised in air at 800°C in order to determine the influence of the previous treatments on the kinetics of oxidation and on the composition of the oxide scales.

57324 **(INIS-BR—42) Influence of Nb, Ti and Zr salts in the mechanical properties of commercial aluminium.** Robert, M.H.; Lucas, M.A.R.; Cupini, N.L. (Universidade Estadual de Campinas (Brazil). Faculdade de Engenharia). 1982. 11p. (In Portuguese). (CONF-821248—7). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781114.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The refinement effect and the influence of Nb, Ti and Zr additions in the ultimate tensile strength of commercial Al were analyzed. The following results were obtained: a high refinement effect for Ti and Zr and only a relative effect for Nb; increase in UTS with decreasing grain size, independent of inoculant material, its amount, shape and distribution of Nb, Ti and Zr particles on Al matrix.

57325 **(INIS-BR—43) Effects of the relative content tungsten/niobium on the solidification and the morphology of a modified M2 steel.** Makray, E.T.; Bresciani Filho, E.; Nazar, A.M.M. (Universidade Estadual de Campinas (Brazil). Faculdade de Engenharia). 1982. 10p. (In Portuguese). (CONF-821248—8). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781115.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The cooling curves for two AISI type M2 steels modified with niobium, were obtained and samples of these steels were quenched at convenient temperatures, in order to correlate microstructure with solidification reactions as well as with W/Nb ratio. Increasing W/Nb ratios resulted in a higher fraction of austenite and complex carbide eutectics.

57326 **(INIS-BR—44) Microstructure and mechanical properties of a stainless steel 18 Cr 11Ni with niobium high content.** Kuri, S.E. (Sao Carlos Univ. (Brazil). Dept. de Engenharia de Materiais). 1982. 7p. (In Portuguese). (CONF-821248—9). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781116.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The microstructure and mechanical properties of low carbon (0,02% weight) and high Niobium content (2% weight) austenitic stainless steel, obtained in a vacuum induction furnace were studied. It was observed that the yield proof stress and the ultimate tensile stress increase with the Niobium content but with a great ductility loss, mainly in the samples annealed in high temperatures, due to the presence of delta-ferrite.

57327 **(INIS-BR—45) Liquid uranium containment in refractories metals.** Duarte, J.L.; Padilha, A.F. (Universidade Estadual de Maringa (Brazil). Dept. de Fisica). 1982. 11p. (In Portuguese). (CONF-821248—10). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781117.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Tests were performed on metallic materials for liquid uranium containment up to 2100°C. The materials Nb, Mo, Ta and W in the form of crucibles were tested at 2100°C for one hour in the presence of flowing argon. After testing, the crucibles were etched using HCl and analysed by optical metallography and electron proble microanalysis. The results are discussed in terms of Berthoud equation and indicated that the solubility limit of the crucible material in uranium at the temperature controls the crucible dissolution by liquid uranium. The various phases formed, the mechanism of dissolution and the possible material for future use are presented and discussed.

57328 **(INIS-BR—48) Aging by precipitation of Nb (C,N) in extra low carbon content steel.** Bruno, J.C.; Kestenbach, H.J. (Sao Carlos Univ. (Brazil). Dept. de Engenharia de Materiais). 1982. 8p. (CONF-821248—13). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781120.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Carbonitride precipitation has been studied in a high-niobium acicular-ferrite-type steel. Interphase precipitation occurred only in those samples in which high transformation temperatures led to distinctly polygonal-ferrite microstructures. In this latter case, precipitation occurred during a subsequent aging treatment, with a strong tendency for heterogeneous nucleation on dislocations.

57329 **(INIS-BR—49) Study of the intrinsic mobility of dislocations in high purity niobium.** de Lima, L.F.C.P.; Benoit, W. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil). Centro de Metalurgia Nuclear; Lausanne Univ. (Switzerland)). 1982. 9p. (In Portuguese). (CONF-821248—14). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781121.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The γ peak due to the double kink generation (DKG) along screw dislocations has been observed in high purity niobium. This peak appears at 270K (lHz) and is unstable. Some special thermomechanical treatments have been realized in order to develop and stabilize this peak. The evolution of the internal friction spectra has been studied as a function of these treatments. The screw dislocations network created by low temperature deformation is unstable and rearranges in two stages: a W stage (180K-240K) and a X stage (280K-350K). The transformation accomplished in the W stage and the effect of the γ peak stabilization treatment have been observed by transmission electron microscopy.

57330 **(INIS-BR—50) Influence of some crystal orientations in mechanical behaviour of zircaloy-4 tubes.** da Costa Viana, C.S.; de Brito Costa, H. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil); Pontificia Univ. Catolica de Sao Paulo (Brazil)). 1982. 7p. (In Portuguese). (CONF-821248—15). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781122.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Zircaloy-4 tubing used in water cooled reactors work under biaxial loading due primarily to the circumferential swelling of the fuel elements approximating a plane-strain behaviour. The tube is produced to have crystal orientations with high yield strengths under biaxial loading and principally in transverse plane strain. The contribution of individual crystal orientations to that specific yield strength is analysed based on crystallographic lower bound yield loci.

57331 **(INIS-BR—51) Study on Nb-H system by scanning electron microscope and transmission electron microscope.** Bulhoes, I.A.M.; Akune, K. (Sao Paulo Univ., Sao Carlos (Brazil). Inst. de Fisica e Quimica; Sao Carlos Univ. (Brazil). Dept. de Engenharia de Materiais). 1982. 9p. (In Portuguese). (CONF-821248—16). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781123.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The microstructures of Nb-H system have been studied using TEM for three hydrogen concentrations; i.e. C sub(H) = 400, 600 and 5000 ppm by weight. The results are analysed to interpret the variation of line resolution of Electron Channeling Patterns of Nb-H, obtained in SEM by the Selected Area Diffraction (SAD) technique, as a function of hydrogen concentration. Finally, the SAD technique has been used to estimate the evolution of strain field in Nb-H (C sub(H) = 760 ppm) with isochronal annealing.

57332 **(INIS-BR—52) Effect of austenitizing temperature in C.O.D. initial values of Niocor 2 steel of two different niobium contents.** Teixeira, J.C.G.; Darwish, F.A.I. (Pontificia Univ. Catolica do Rio de Janeiro (Brazil). Dept. de Ciencia dos Materiais e Metalurgia). 1982. 9p. (In Portuguese). (CONF-821248—17). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781124.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The effect of the austenitizing temperature on the fracture toughness of Niocar 2 steel of two different niobium contents (0,04 and 0,16%) was studied by means of C.O.D. testing. Except for very elevated austenitizing temperatures (1250°C), C.O.D. values for initiation were shown to be higher for the high niobium steel. The decrease in toughness associated with elevated austenitizing temperatures is attributed to the presence of acicular phase transformation products.

57333 **(INIS-BR—54) Properties of the heat affected zone of a Nb microalloyed steel.** Xavier, C.A.A.; Azambuja, S. (Companhia Siderurgica Nacional, Volta Redonda (Brazil)). 1982. 21p. (In Portuguese). (CONF-8211109—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781126.

From 8. Brazilian meeting on welding technology; Rio de Janeiro, Brazil (21 Nov 1982).

The weld thermal cycles and stress relieve heat treatment influences on multipass welds, by shielded metal arc welding process (SMAW), were evaluated in the heat affected zone of a Nb microalloyed steel, through Charpy-V notch tests, hardness measurements and microstructural aspects.

57334 **(INIS-BR—55) Metallographic observations of AISI 304-copper dissimilar joints.** de Madeiros, R.C.; de Carvalho Perdigao, S. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). 1982. 16p. (In Portuguese). (CONF-8211109—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781127.

From 8. Brazilian meeting on welding technology; Rio de Janeiro, Brazil (21 Nov 1982).

The current work informs one on the SMAW dissimilar joints embrittled by molten copper. Bead on plate of that metal were deposited on four different base metals to evaluate the phenomena. Conventional and non conventional welding methods were employed to obtain dissimilar joints of AISI 304-Cu. The latter

were observed metallographically. These results are to be complemented by mechanical testing actually being performed.

57336 **(INIS-BR—56) Microstructure in welding zone of a zircaloy 4 tube welded by TIG process.** Bolfarini, C.; Domingues Filho, H. (Instituto de Engenharia Nuclear, Rio de Janeiro (Brazil)). 1982. 20p. (In Portuguese). (CONF-8211109—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781128.

From 8. Brazilian meeting on welding technology; Rio de Janeiro, Brazil (21 Nov 1982).

The details concerned with the welding of seamless Zircaloy 4 tubes for nuclear application and the earlier welding tests made in the tubes that will be used for the construction of the Argonautas' Reactor fuel element, are described. Based on the references the microstructure changes in the heat affected zone were analyzed in respect to the material's performance in operation.

57338 (INIS-mf—8473, pp vp) **Diffusion bonding of zirconium alloys to steel.** Cooper, M.H. (Bristol Aerospace Ltd., Winnipeg, Manitoba (Canada)); Serkes, R.; Wright, M.G. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Diffusion bonding has been developed to join zirconium alloys to carbon steel, providing a strong, tough, compact and leak-tight joint. The quality of the joint is verified by means of a variety of mechanical, corrosion and irradiation tests. The method of manufacture is described. Long-term service tests are presently being mounted. Potential and actual applications to the CANDU-PHW system are discussed.

57337 (INIS-mf—8560, pp vp) **Nuclear magnetic resonance of oriented ^{56}Co and ^{57}Co nuclei in iron.** Dupak, J.; Finger, M. (Joint Inst. for Nuclear Research, Dubna (USSR)); Malinsky, P. (Ceske Vysoke Uceni Technicke, Prague (Czechoslovakia). Fakulta Jaderna a Fysikalne Inzenyrska); Rotter, M.; Sedlak, B. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57338 (INIS-mf—8560, pp vp) **Magnetic properties of pseudobinary compounds with boundary phases UFe_2, UCo_2, UNi_2.** Sechovsky, V.; Toul, J. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57339 (INIS-mf—8560, pp vp) **Magnetic and electrical properties of uranium alloys with some 3d-elements.** Hrebik, J.; Sternberk, J.; Havela, L. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni); Zentko, A. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57340 (INIS-mf—8560, pp vp) **Study of electrical and magnetic properties of UCu_5.** Havela, L.; Hrebik, J.; Stuka, C.; Sternberk, J. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57341 **(JAERI-M—82-030) New iron base heat resisting alloys for application in high temperature gas-cooled reactor.** Tamura, M.; Kondo, T. (Japan Atomic Energy Research Inst., Tokyo). Apr 1982. 35p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703722.

Heat resisting steels with relatively low nickel content have been designed and tested, which showed creep strength and corrosion resistance equivalent or superior to the present prime candidate nickel base alloys. The materials are expected to substitute nickel base alloys in the applications to the components in reactor core, e.g. neutron absorber sheathing, for which most nickel rich alloys are not suited because of their susceptibility to the loss of ductility caused by thermal neutron irradiation. 12Cr-12Ni-5Mo-5Cu-iron base alloys were designed and several similar versions were prepared. Tests at high temperatures were conducted on tensile properties at up to 1000°C, creep rupture properties at 700 – 900°C, toughness after aging at 700 and 800°C and corrosion resistance in the impure helium gas at 900°C. The helium environment was prepared simulating the impurity contents in the coolant of high temperature gas-cooled reactor. After exposure test to the impure helium, changes in weight and carbon content were measured, and metallurgical analysis was made by optical microscopy, EPMA analysis and X-ray diffraction. It was found that creep rupture strength of a heat of 12Cr-12Ni-5Mo-5Cu steel with small amounts of niobium was superior to the prime candidate material, Hastelloy alloy XR and was comparable to Inconel alloy 617, although some significant decrease in toughness occurred after aging at intermediate temperatures. Weight gain due to oxidation and carbon increase due to carburization of this steel in the simulated impure helium gas were lower than those of Hastelloy alloy XR. In conclusion this alloy, with appropriate modification, can be a potential substitutional material as the structural material to be used under thermal neutron exposure. The material may also be potential for general structural applications for high temperature gas-cooled reactors, substituting the commonly used material like Incoloy alloy 800H.

57342 **(JAERI-M—82-052) Effects of cyclic aging on mechanical properties and microstructures of hastelloy alloy X.** Kikuchi, M.; Watanabe, K.; Kondo, T. (Japan Atomic Energy Research Inst., Tokyo). Jun 1982. 35p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703723.

In attempt of application to the high temperature structural components for the very high temperature gas cooled-reactor (VHTR), microstructural stability of Hastelloy alloy X and its influence to the room temperature toughness were investigated. The mechanical property changes, particularly aged by thermal cycling to be expected in the reactor operation were examined by tensile tests, Charpy impact tests, hardness tests, EPMA analysis and TEM observation. In addition to isothermal aging, cyclic aging was given up to 125 cycles with peak temperature at 700 – 1000°C. Holding time was given for 8 hours at each peak temperature so that total accumulated time at the peak reached 1000 hours. The results indicate that the changes in ductility of the cyclically aged materials are generally enhanced relative to those of isothermally aged. The observed trend was consistent with the enhanced carbide precipitation. For the peak aging temperature up to 900°C, the ductility loss of the cyclic case is higher than that of the isothermal, while the relation is reversed at 1000°C.

57343 **(JAERI-M—82-062) Cyclic crack growth through typical weld HAZ microstructures of SA 533 gr.B steel in simulated BWR water environment.** (Japan Atomic Energy Research Inst., Tokyo). Jun 1982. 27p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703724.

The effect of BWR water environment on the cyclic crack growth characteristics of SA 533 gr.B steel specimen of a common heat with different microstructures was examined with major emphasis placed on the crack growth along the weld heat affected zone (HAZ). The variation employed was provided by three different heat treatments, i.e. (1) air-quenched and tempered, (2) oil-

quenched and tempered and (3) as oil-quenched, each of which were to simulate the localized variability of typical alternated microstructures of the weld-heat affected zones appearing along fusion lines. In the preliminary air tests, no essential difference was observed among all kinds of materials in their ΔK versus da/dN relationships for two stress ratio conditions, i.e. R = 0.1 and 0.5. In the BWR water environment, the crack growth rates of those three types of materials were accelerated relative to the air environment results. The degrees of acceleration were not greatly different to each other under stress ratio, R = 0.1, while considerable difference was noted in case of higher stress ratio, R = 0.5. Under the high stress ratio test condition, the quenched material, which was with martensitic structure and hardening, showed highest degree of environment sensitivity among others. The obtained results were consistent with the cyclic crack growth rates when cracks were advancing along weld fusion lines through HAZ, where considerable level of residual stresses were to have remained.

57344 **(Juel—1786) Influence of carburisation on the room temperature tensile properties of high temperature alloys.** Ennis, P.J.; Lupton, D.F.; Nickel, H.; Schuster, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). May 1982. 59p. Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

A series of doctoral and diploma investigations which have been carried out at the Institute of Reactor Materials of the KFA are reported. The influence of both thermal exposure and carburisation at 800°C and above on the room temperature tensile properties of Incoloy 800 H, Inconel 617, Hastelloy X and Nimonic 86 has been studied and the results have been compared with literature data. It is shown that the room temperature ductility of Incoloy 800 H is much less sensitive to carburisation than that of the nickel-base alloys. This is attributed to the greater volume fraction of carbide formed in the nickel-base alloys for a particular bulk carbon content. In the nickel-base alloys carbide volume fractions are higher than in iron-base alloys due to the lower solubility of carbon and to the formation of M_6C carbides. The ductility of reformer and intermediate heat exchanger (IHX) tubes after long service times in a process heat high temperature reactor has been estimated using carburisation rates found in corrosion experiments. The data indicate that a reformer tube of Incoloy 800 H should retain a room temperature ductility equivalent to 5% tensile elongation - a normal minimum requirement in conventional engineering design - over the anticipated service life of 140,000 h. For the IHX tubes, the impurity concentrations in the primary coolant must be carefully controlled in order to avoid embrittlement by carburisation. Alternatively, a design concept to allow the use of low ductility tubes will be required. Suggestions are given for future work, in particular for alloy development to produce alloys which are less severely embrittled by carburisation.

57345 **(KFK—3501) Electrical stability of NbTi-superconductors with additional copper and aluminium.** Turowski, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Technische Physik). Apr 1983. 15p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751266.

A commercial available NbTi-superconductor with a small Cu/SC ratio of 1.9 was additionally electrically stabilized by soldering a copper tape or an aluminium tape to the conductor, respectively. The conductor samples were immersed in liquid helium and then partially brought into the normal conducting state by a heater pulse at different transport currents and magnetic fields. From the following recovery of the superconducting state an effective heat flow rate of 0.45 Watt/cm² through the conductor surface into the liquid helium could be determined. The high electrical conductivity of aluminium contributes fully to the electrical stability of the composite conductor by leading to a considerable higher recovery current than in a pure copper matrix at the same overall current density.

57346 **(KFK—3506) Stress corrosion cracking failure behavior of Zircaloy-4 tubing at elevated temperatures.** Spino, J.; Hofmann, P. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Apr 1983. 28p. (CONF-830563—4). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751142.

From Enlarged halden program group meeting; Loen, Norway (23 May 1983).

In addition, basic experiments to investigate the iodine/zirconium chemical interaction and the decomposition behavior of CsI by various oxygen potentials have been performed. The gaseous ZrI_4 is probably responsible for stress corrosion crack initiation and propagation. The estimated critical ZrI_4 pressures above which low-ductility SCC failure of zircaloy tubing always occurs varies between 5 mbar at 550°C and 43 mbar at 800°C. Extrapolation of these values to lower temperatures and comparison with literature data show good agreement. CsI can decompose at rather low oxygen potentials resulting in a sufficient iodine activity to cause low-ductility SCC failure of the cladding.

57347 **(LA-UR—83-2572) Study of defects produced in tungsten by 800-MeV protons using field-ion microscopy.** Farnum, D.J.; Sommer, W.F.; Inal, O.T. (Los Alamos National Lab., NM (USA); New Mexico Inst. of Mining and Technology, Socorro (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-830942—37). NTIS, PC A02/MF A01. Order Number DE84001359.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Defects produced in tungsten by 800 MeV proton bombardment have been studied on the atomic scale with a Field Ion Microscope. The material was subjected to a fluence, as measured by radiochemistry, of 10^{22} pm^{-2} (~ 0.1 displacements per atom) at a temperature of 300K. A vacancy concentration of 10^{-3} was observed (calculated thermal equilibrium vacancy concentration is ~ 10^{-66} at a calculated temperature of 300K). No vacancies were observed in the unirradiated samples. Since vacancies are essentially immobile (D/sub v/ ~ 10^{-97} cm²/sec) at the irradiation temperature used in this study, it is believed that the observed concentrations are those of the radiation produced vacancies that did not spontaneously recombine. The observed interstitial concentration was lower than the vacancy concentration consistent with a higher diffusion rate for interstitials. Additionally, a depleted zone was observed consisting of approximately 300 vacancies. This void volume lies along a [121] pole and has an elongated shape. It is postulated that this damaged region was caused by a recoiling W atom after it had undergone an internuclear cascade after collision with an incident proton. This type of defect may be the nucleus for subsequent void growth when the irradiation is carried out in the void-growth temperature regime.

57348 **(LA-UR—83-2742) Structural performance of ceramics in a high-fluence fusion environment.** Clinard, F.W. Jr.; Hurley, G.F.; Hobbs, L.W.; Rohr, D.L.; Youngman, R.A. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 8p. (CONF-830942—46). NTIS, PC A02/MF A01. Order Number DE84001311.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

The ceramics $MgAl_2O_4$, Al_2O_3 (single crystal), Si_3N_4, and a SiC/graphite laminate were irradiated to ~ 2 x 10^{26} n/m² (E > 0.1 MeV) at 680 and 815K. Spinel exhibited near-zero dimensional change, while Al_2O_3 and Si_3N_4 swelled ~ 3 vol % and 1 vol % respectively. Strength of $MgAl_2O_4$ was increased, while strength of Al_2O_3 and Si_3N_4 were not greatly altered. The SiC/graphite composite, tested only at 680K, suffered almost complete delamination as a result of swelling of the SiC and densification of the graphite. These results are discussed in terms of microstructural alterations and related to various fusion applications.

57349 (LBL—16726) Calculations of composition boundaries of saturated phases. Brewer, L.; Hahn, S. (Lawrence Berkeley Lab., CA (USA)). 27 Sep 1983. Contract AC03-76SF00098. 10p. NTIS, PC A02/MF A01. Order Number DE84001665.

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A program for the HP-41CV calculator is presented for calculating the equilibrium composition boundaries of pairs of saturating solids, liquids, or a combination of a solid and liquid. The activity coefficients must be represented in the form ln γ_1 = (b/sub h// T - b/sub s/)x_2^2 + (c/sub h//T - c/sub x/)x_2^2 where h refers to an enthalpy contribution and s refers to an excess entropy contribution. For solid-liquid equilibria, enthalpies and entropies of fusion are required. For all equilibria, provision is made for use of hypothetical standard states such as the Henry's Law standard states. For example, in treating solid solutions of molybdenum in face-centered cubic metals such as Ni, Rh, or Pt, it is sometimes convenient to use a hypothetical fcc standard state of Mo which represents the limiting Henry's Law behavior of Mo in the fcc metal and has much different properties than a real fcc molybdenum solid.

57350 (NASA-TM-X—2576) Mechanical properties of electron-beam-melted molybdenum and dilute molybdenum-rhenium alloys. Klopp, W.D.; Witzke, W.R. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Jun 1972. 19p. NTIS, PC A02/MF A01.

A study of molybdenum and three dilute molybdenum-rhenium alloys was undertaken to determine the effects of rhenium on the low-temperature ductility and other mechanical properties of molybdenum. Alloys containing 3.9, 5.9, and 7.7 atomic percent rhenium all exhibited lower ductile-brittle transition temperatures than did the unalloyed molybdenum. The maximum improvement in the annealed condition was observed for molybdenum - 7.7 rhenium, which had a ductile-brittle transition temperature approximately 200°C (360°F) lower than that for unalloyed molybdenum. Rhenium additions also increased the low- and high-temperature tensile strengths and the high-temperature creep strength of molybdenum. The mechanical behavior of dilute molybdenum-rhenium alloys is similar to that observed previously for dilute tungsten-rhenium alloys.

57351 (NASA-TN-D—4955) Review of ductilizing of group via elements by rhenium and other solutes. Klopp, W.D. (National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center). Dec 1968. 35p. NTIS, PC A03/MF A01.

The properties of Group VIA-base alloys with rhenium (Re) and with other solutes from Groups VIIA and VIIIA were reviewed to determine correlations pertinent to the lowered ductile-brittle transition temperatures observed in both near-saturated and dilute Group VIA-Re alloys. The rhenium ductilizing effect, originally observed in chromium (Cr), molybdenum (Mo), and tungsten (W) alloys containing 25 to 35 atomic percent Re, is not specific to rhenium but is also found in alloys with other solutes from Group VIIA and the early portions of Group VIIIA. The ability of a solute to promote the rhenium ductilizing effect is related to the position of the solute in the periodic table. The decreased hardnesses and lowered ductile-brittle transition temperatures observed in dilute Group VIA-Re alloys are attributed to the phenomenon of solution softening. This phenomenon occurs at temperatures below about 0.2 of the absolute melting point (Tm) and increases in magnitude with decreasing temperature. Although additions of rhenium are more effective than those of other Group VIIA and VIIIA elements in softening the Group VIA elements, the phenomenon is apparently present in most body-centered-cubic alloys containing small additions of substitutional solutes. The softening effect is related to a decrease in the Peierls stress on alloying. 51 references, 20 figures, 2 tables.

57352 (NUCLEBRAS-CDTN—428) Growing rate and the type of corrosion products of aluminium alloy AA 5052 in deionized water at temperature up to 300°C. Ferreira, E.G. (Centro de Desenvolvimento da Tecnologia Nuclear, Belo Horizonte (Brazil)). 1980. 107p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703711.

The process of corrosion concerning the aluminum alloy AA5052 in deionized water at temperatures of 40°C, 80°C, 90°C, 140°C, 200°C and 280°C is studied. The following methods are used: periodic weighting of the test samples; analysis by neutronic activation of the corrosion products dissolved in water; thermogravimetric and thermodifferential analysis; analysis through X-ray diffraction and from metalographic observations of the crystals produced in the corrosion process; an optical microscope using polarized and normal light and a scanning electronic microscope. The activation energies are calculated for the corrosion film formation, and for the dissolution of the corrosion products in the deionized water.

57353 (OEFZS—4207) Handling of potassium. Schwarz, N.; Komurka, M. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. 30p. (In German). (RS—216/83). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703712.

As a result for the Fast Breeder Development extensive experience is available worldwide with respect to Sodium technology. Due to the extension of the research program to topping cycles with Potassium as the working medium, test facilities with Potassium have been designed and operated in the Institute of Reactor Safety. The different chemical properties of Sodium and Potassium give rise in new safety concepts and operating procedures. The handling problems of Potassium are described in the light of theoretical properties and own experiences. Selected literature on main safety and operating problems complete this report.

57354 (OEFZS—4208) Safety experiments and fire extinction experiments with alkali metals. Schwarz, N. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. 35p. (In German). (RS—217/83). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703713.

In addition to experimental runs with test facilities, fire extinction experiments are performed routinely with open spill-catchpans. Certain safety aspects of the high temperature test facility HT 3 as well as a different behaviour of Sodium and Potassium fires necessitated the realization of fire extinction experiments with a more exact problem definition. The report gives a description of the test facilities and the experiments performed.

57355 (OEFZS-A—0412) Behaviour of materials under plasma exposure. Ruedenauer, F.G.; Dobrozemsky, R.; Steiger, W. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Mar 1983. vp. (In German). (PH—367/83). Available by the Austrian Academy of Sciences, Dr. Ignaz Seipelplatz 2, 1010 Vienna.

Limited Distribution.

The 3-dimensional distribution of hydrogen in plasma-exposed samples and changes in chemical composition of INCONEL under plasma exposure were determined on a secondary ion microprobe. Absolute values for hydrogen contained in samples were measured by hot vacuum extraction. Diffusion of hydrogen in steel with respect to the formation of radiation induced lattice defects was computer simulated. A low energy ion implantation system coupled to the secondary ion microprobe is described which allows synergetic simulation of plasma - wall interactions.

57356 (ORNL/CSD—122) Modeling binary-alloy solidification processes: numerical implementation. Solomon, A.D.; Alexiades, V.; Wilson, D.G. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 35p. NTIS, PC A03/MF A01. Order Number DE84001587.

The numerical implementation of a mathematical model of a binary alloy solidification process is described. The model takes into account the mushy zone of dendritic growth between liquid- and solid-phase regions.

57357 (PER—65) Comparative study of the effects of thermal- and fast-neutron irradiation on some selected dilute face centered cubic alloys. Piani, C.S.B. (Atomic Energy Board, Pelindaba, Pretoria (South Africa); Rand Afrikaans Univ., Johannesburg (South Africa)). Dec 1981. 85p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703729.

Point defect reactions in Pt and Cu and certain dilute alloys were investigated using a resistivity method following either fast-neutron or thermal-neutron irradiation at 4 K. An enhanced irradiation-induced resistivity in certain of the alloys could be attributed to actual enhanced defect production. This was related to a mechanism involving defocussing of replacement collision chains at impurities, together with possible nucleation of interstitial clusters at impurities. The close-pair recovery substages I(A), I(B) and I(C), strongly evident in thermal-neutron-irradiated materials, were suppressed by fast-neutron irradiation. This could be related to the higher energy transfers during irradiation and to significant amounts of irradiation annealing (spontaneous recombination). Fast-neutron cascades favoured interstitial clustering and reduced recovery of the interstitial migration substages I(D) and I(E). Interstitial trapping at impurities during I(D) and I(E) although evident, was less effective in fast-neutron irradiation. Higher concentrations of impurities reduced close-pair recovery as well. Stage II detrapping was related to the trapping efficiency of impurities, as well as to the effective defect concentration. Oversized impurities (Au in Pt or Cu) acted as weak traps, while undersized impurities (Cu or Ni in Pt) appeared to from deeper 'mixed-dumbbell' traps. The 120 K substage in Pt had a unique activation energy approximately 0,37 plus minus 0,03 eV, but did not seem to be due to an impurity detrapping process. It was not possible to attribute the 360 K stage in Pt with a unique activation energy in fast-neutron irradiation.

57358 (PNL—4727) Double shell slurry low-temperature corrosion tests. Divine, J.R.; Bowen, W.M.; McPartland, S.A.; Elmore, R.P.; Engel, D.W. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 73p. NTIS, PC A04/MF A01. Order Number DE84001065.

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A series of year-long tests have been completed on potential double shell slurry (DSS) compositions at temperatures up to 100°C. These tests have sought data on uniform corrosion, pitting, and stress-corrosion cracking. No indication of the latter two types of corrosion were observed within the test matrix. Corrosion rates after four months were generally below the 1 mpy (25 μm/y) design limit. By the end of twelve months all results were below this limit and, except for very concentrated mixtures, all were below 0.5 mpy. Prediction equations were generated from a model fitted to the data. The equations provide a rapid means of estimating the corrosion rate for proposed DSS compositions.

57359 (UCRL—89325) Reduction of tritium permeation through iron using aluminum-ion implantation. Musket, R.G.; Steward, S.A.; Brown, D.W.; Uribe, F.S. (Lawrence Livermore National Lab., CA (USA)). Nov 1983. Contract W-7405-ENG-48. 6p. (CONF-831171—4). NTIS, PC A02/MF A01. Order Number DE84000184.

From American Vacuum Society meeting; Boston, MA, USA (1 Nov 1983).

Although ion implantation has been shown to be an excellent technique for modifying many surface properties of metallurgical materials, this report contains the first data on its use to reduce the permeation of a gas through a material. In particular, we summarize the initial results of a study using aluminum ion implantation combined with a post-implant treatment for creation of a barrier to tritium permeation through polycrystalline iron.

57360 (Y/DV—227) Effects of electron-beam welding on uranium-6 weight percent niobium alloy. Stanaland, V.A.; Chapman, L.R.; Mustaleski, T.M. Jr. (Oak Ridge Y-12 Plant, TN (USA)). 29 Sep 1982. Contract W-7405-ENG-26. 70p. NTIS, PC A04/MF A01. Order Number DE84000340.

The heat-affected zone caused by electron-beam welding on the uranium-6 wt % niobium (U-6Nb) alloy was determined by metallographic examinations, microhardness tests, and temperature profiles. Four distinct regions and their phases were determined. Region I corresponds to the base metal [< 1.5 mm (< 0.06 in.) from the weld fusion boundary] that was previously heat treated to form the α″-aged phase. The heat-affected zone was divided into two regions: Region II [between 0.38 and 1.5 mm (0.015 and 0.06 in.) from the weld fusion boundary] and Region III from the weld fusion boundary to 0.38 mm (0.015 in.) away. Region II, which was characterized by heavy twinning, was believed to consist of the α″-quenched +γ° phases. Region III was representative of an α″-quenched structure. The fourth region or fusion zone was typical of a cast structure.

57361 (Y/DV—315) Dilatometric investigation of phase-transformation kinetics in HP 9-4-20 steel. Vandermeer, R.A. (Oak Ridge Y-12 Plant, TN (USA)). 11 Oct 1983. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01. Order Number DE84001180.

Dilatometry has been used to investigate the phase transformation behavior of HP 9-4-20 steel. The decomposition of austenite to either martensite or bainite was monitored during continuous cooling or isothermal holds. The martensite start temperature, M/sub s/, was found to be 290 +- 3°C for cooling rates between 0.01°C/s and 20°C/s. Isothermal decomposition of austenite to bainite occurred both above and below M/sub s/ and was accelerated if some athermal martensite was formed first. The previously published TTT (time-temperature-transformation) diagram for HP 9-4-20 steel has been modified to include the sub M/sub s/ formation of bainite. To avoid the formation of bainite during cooling through its formation range of 324°C to 224°C, a critical cooling rate of 0.05°C/s must be exceeded. Partial time-dependence reversion of martensite to austenite took place during tempering at temperatures as low as 600°C. The extent and kinetics of reversion increased with increases in tempering temperature above 600°C. The linear coefficients of thermal expansion of austenite, bainite, and martensite in HP 9-4-20 steel have been determined.

57362 Induced neutron magnetic form factor of $LaSn_3$. Zarestky, J.; Stassis, C.; Harmon, B.N.; Begum, J.A. (Ames Lab., IA (USA); Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Physics); Moon, R.M.; Liu, S.H. (Oak Ridge National Lab., TN (USA). Solid State Div.); Koelling, D.D. (Argonne National Lab., IL (USA)). *Journal of Magnetism and Magnetic Materials;* **30**: No. 1, 61-66(Aug 1983).

Polarized neutron scattering techniques have been used to study the spatial distribution of the magnetization induced in a single crystal of $LaSn_3$ by a magnetic field of 42.5 kG at 100 K. We find that the magnetic form factor decreases very rapidly with increasing scattering angle, and bears no resemblance to the spin orbital free-atom magnetic form factor. The experimental results are in reasonable agreement with band theoretical calculations of the spin magnetic form factor of $LaSn_3$. We conclude that (a) the spin part is the dominant contribution to the bulk susceptibility of $LaSn_3$ and (b) there is a substantial amount of Sn-5p electronic character in the wavefunctions near the Fermi level.

57363 Tensile testing of U/5.3 wt% Nb and U/6.8 wt% Nb alloys. Wood, D.H.; Dini, J.W. (Lawrence Livermore National Lab., CA (USA)); Johnson, H.R. (Sandia National Labs., Livermore, CA (USA)). *Journal of Nuclear Materials;* **114**: No. 2/3, 199-207(Feb 1983).

Induction-melted and rolled uranium-niobium alloys of two compositions were investigated by tensile testing. One composition (U/5.3 wt% Nb) was quenched to form the α″sub(b) phase at room temperature; the other (U/6.8 wt% Nb) was quenched to form the γ° phase. Specimens of both alloys were fabricated into tensile bars from as-quenched material and from quenched material aged at 200°C for 4 h. Duplicate sets of these tensile bars were prepared bare and electroplated with nickel. All tensile bars (except the controls) were submitted to accelerated environmental exposure in moist hydrogen, moist nitrogen, dry nitrogen, or vacuum by holding them in the respective atmosphere at 70°C for 37 weeks. Tensile testing was done in a vacuum. The shapes of the tensile curves showed large differences caused by differences in composition,

aging at 200°C, and, in the case of the γ° material only, the 70° environmental exposure, which also caused age hardening. Some indication of premature fracture resulting from hydrogen exposure was observed in U/5.3 wt% Nb but not in U/6.8 wt% Nb. We currently attribute the unusual shape of the tensile curves in these alloys to twin interface migrations.

57364 **Photoelectron spectroscopy. New angle-resolved spectrometer and study of dilute alloys.** Bosch, A. Groningen, Netherlands; University Library, Oude Kijk in 't Jatstraat (13 Sep 1982). 170p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (Netherlands).

Includes Dutch summary; 250 refs.

In this work examples of the various aspects of photoelectron spectroscopy are given. The investigation was started with the development of an angle-resolved spectrometer so that the first chapters deal with angle-resolved ultra-violet photoelectron spectroscopy. To indicate the possibilities and pitfalls of the technique, in chapter II the theory is briefly reviewed. In chapter III the instrument is described. The system is based on the cylindrical mirror deflection analyzer, which is modified and improved for angle-resolved photoelectron spectroscopy. In combination with a position sensitive detector, a spectrometer is developed with which simultaneously several angle-resolved spectra can be recorded. In chapter IV, the results are reported of angle-integrated UPS experiments on dilute alloys. Using the improved energy resolution of the instrument the author was able to study the impurity states more accurately and shows that the photoemission technique has become an important tool in the study of impurities and the interactions involved. XPS and Auger results obtained from dilute alloys are presented in chapter V. It is shown that these systems are especially suited for the study of correlation effects and can provide interesting problems related to the satellite structure and the interaction of the impurity with the host. In chapter VI, the valence bands of ternary alloys are studied with UPS and compared to recent band structure calculation. The core level shifts are analyzed in a simple, thermodynamic scheme.

57365 **Analysis of discrete and continuous laser induced fluorescence spectra of the A $^1u^+$ sub(u) - X $^1\Sigma^+$ sub(g) band system of Sr_2.** Gerber, G.; Moeller, R. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Laser induced fluorescence spectra of the gaseous Sr_2 excimer molecule have been measured. The spectra contain discrete molecular fluorescence series, regularly modulated continuous fluorescence and an unstructured continuum. Analysis of the molecular line spectra yields for the first time Dunham coefficients for the X $^1\Sigma^+$ sub(g) ground state and the A $^1\Sigma^+$ sub(u) excited state. Using the intensity distribution of the modulated continuum which is associated with bound-free transitions the repulsive potential of the ground state up to 3000 cm^{-1} above the dissociation limit has been determined. The unstructured continuum can be analyzed as due to two types of continuous fluorescence. The dissociation energy of Sr_2 has been determined to Dsub(e) (X) = 965 +- 45 cm^{-1}.

57366 **Electrical resistivity-temperature scale of tungsten.** Mundy, J.N. (Argonne National Lab., IL). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* **46**: No. 2, 345-349(1982).

A careful examination of the electrical resistivity-temperature scales for tungsten used in earlier experiments on the quenched-in resistivity of tungsten has shown that a more correct fitting procedure can be used. The results of this fitting are presented.

57367 **Radiation induced amorphous transformation in intermetallic compounds.** Brimhall, J.L.; Kissinger, H.E.; Charlot, L.A. (Pacific Northwest Lab., Richland, WA). pp 235-241 of Metastable materials formation by ion implantation. Picraux, S.T.; Choyke, W.J. (eds.). New York, NY; Elsevier Science Publishing Co., Inc. (1982). Contract AC06-76RL01830.

Intermetallic compounds and ordered phases in the Ti-Ni, Ti-Fe, Re-Ta, and Mo-Ni systems became amorphous after high energy, ion irradiation. Compounds in the Ni-Al and Fe-Al systems remained crystalline and formed dislocation networks after similar irradiation. The ease of amorphous formation correlated best with the lack of solubility within the phase field. The high internal energy of the defect state in these limited solubility alloys is believed responsible for the tendency to transform to an amorphous state. A correlation with other properties such as atom size ratio or outer electron concentration was not found.

57368 **Electrons on the threshold of localization. A study of some liquid lithium- and sodium-based alloys.** van der Marel, C. Groningen, Netherlands; Rijksuniversiteit Groningen (1981). 182p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (NL).

Includes Dutch summary; 227 refs; Includes previously published material.

This thesis deals with a series of liquid alloy systems exhibiting gradually increasing deviations from simple metallic behaviour: Li-Na, Li-Mg, Li-Cd, Li-In, Li-Sn, Li-Pb, Na-Sn and Na-Se. In chapter 2 those parts of the theory on electronic and thermodynamical properties of liquid metals which are used are summarized. In chapter 3 details are given on the equipment and the experimental techniques. Thermopower measurements on liquid Li-Na alloys, and more particular the critical effects observed in this quantity close to the top of the immiscibility curve, are reported in chapter 4. Measurements of the Knight shift of pure liquid lithium at temperatures between 180 °C and 720 °C are reported in chapter 5. Chapter 6 describes the ^{7}Li Knight shift measurements on liquid Li-Mg alloys. The chapters 7, 8 and 9 are concerned with measurements (a.o. electrical resistivity and Knight shift) on liquid Li-Cd, Li-In, Li-Sn and Li-Pb alloys. Measurements of the electrical resistivity of liquid Na-Sn alloys have been carried out consecutive to those on liquid Li-Sn alloys, in order to observe the effect of the difference in atomic volume of Li and Na; this difference amounts to a factor of nearly two. The measurements on liquid Na-Sn are reported and discussed in chapter 10. Measurements of the electrical resistivity of selenium-rich liquid Na-Se alloys are presented in chapter 11. In this case the metal-nonmetal (MNM) transition is approached (but not attained in the reported measurements) from the other side. Some general conclusions are drawn in chapter 12.

3602 Ceramics, Cermets, And Refractories

REFER ALSO TO CITATION(S) 56939, 56939, 56966, 57132, 57580

57369 **(CONF-820945—12) Near-surface modification of α-Al_2O_3 by ion implantation followed by thermal annealing.** Naramoto, H.; McHargue, C.J.; White, C.W.; Williams, J.M.; Holland, O.W.; Abraham, M.M.; Appleton, B.R. (Oak Ridge National Lab., TN (USA); Japan Atomic Energy Research Inst., Tokai, Ibaraki). Sep 1982. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE84000641.

From International conference on ion beam modification of materials; Grenoble, France (6 Sep 1982).

Portions are illegible in microfiche products.

Structural changes in α-Al_2O_3 crystals implanted by ^{48}Ti and ^{90}Zr and subjected to thermal annealing have been investigated using ion scattering-channeling techniques. For the case of Ti implantation, the implanted species exhibits substitutionality in the as-implanted condition and undergoes anisotropic diffusion along the (0001) axis at a temperature of 1200°C which gives rise to the formation of needle-like precipitates partially coherent along the (0001) direction. For the case of Zr implantation, recovery of lattice damage begins in the Al sublattice at ~ 800°C and in the O sublattice at ~ 1300°C. Zr is not observed to be substitutional even

after annealing to temperatures of 1600°C. Results on the structural changes are correlated with measured mechanical property changes for the case of Cr, Ti, and Zr implanted into Al_2O_3 and thermally annealed to temperatures of 1600°C.

57370 **(DOE/ER/04837—8) Electronic structure of defects in oxides. Final report, December 1, 1980-November 30, 1981.** Summers, G.P. (Oklahoma State Univ., Stillwater (USA). Dept. of Physics). 1981. Contract AS05-76ER04837. 26p. (ORO—4837-8). NTIS, PC A03/MF A01. Order Number DE83018200.

Portions are illegible in microfiche products.

Details of the electronic structure of F-type centers and charge trapping in the series of oxides SrO, CaO, MgO, α-Al_2O_3 and $MgAl_2O_4$ have been determined using photoconductivity, luminescence, and fluorescence lifetimes. Measurements were made over the spectral range 1.5 to 6.5 eV and over the temperature range 4 to 350 K. The centers were introduced into SrO by electron, proton or neutron bombardment, into CaO, MgO, and α-Al_2O_3 by electron or neutron bombardment, or thermochemical reduction, and into $MgAl_2O_4$ by particle bombardment. In some cases, notably CaO, MgO, and α-Al_2O_3 exhibit phosphorescence near room temperature, with the emission occurring at the wavelength corresponding to the F center. Our work suggests that the electron trap involved is H^- ions, but this has only so far been confirmed for MgO.

57371 (HMI-B—370, pp 16-23) **Further investigations of the mixed crystal system Dy(Psub(1-x)Vsub(x)O_4).** Kettler, P.; Steiner, M. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57372 **(INIS-BR—23) Crystallographic and oxidation kinetic study of uranium dioxide by high temperature X-ray diffractometry.** Teixeira, S.R.; Imakuma, K. (UNESP, Presidente Prudente (Brazil). Inst. de Planejamento e Estudos Ambientais; Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). [nd]. 12p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781095.

The structural transformation of UO_2 sintered plates is studied as a function of temperature using X-ray diffractometry. The thermal expansion coefficient of UO sub(2.05) is determined and the structural transformation during isothermal oxidation is observed. The results favored a oxidation mechanism in which the rate-controling process is the diffusion of oxygen through the product layer of the new phase. Activation energies for the oxidation of UO_2 to UO sub(2.25) are found for different crystallographic planes (h,k,l). From this one can conclude that there is a preferential occupation of interstitial oxygen atoms within the UO_2 structure.

57373 **(INIS-BR—26) Production of sintered alumina from powder; optimization of the sinterized parameters for the maximum mechanical resistance.** da Rocha, J.C. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). Feb 1981. 112p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781129.

Pure, sinterized alumina and the optimization of the parameters of sinterization in order to obtain the highest mechanical resistance are discussed. Test materials are sinterized from a fine powder of pure alumina (Al_2O_3), α phase, at different temperatures and times, in air. The microstructures are analysed concerning porosity and grain size. Depending on the temperature or the time of sinterization, there is a maximum for the mechanical resistance.

57374 **(INIS-BR—28) Thermodynamic determination of fluorite phases of the $ULnO_4$ type.** Paula, H.C.B. (Pernambuco Univ., Recife (Brazil). Dept. de Energia Nuclear). Dec 1981. 70p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83781097.

A method for the determination of structure and thermodynamic stability of fluorite phases of the $ULnO_4$ type is presented. Through the use of a solid body galvanic chain with CaO-doped ZrO_2 working as an oxygen ion conductor solid electrolyte, phase transformation temperatures are determined, as well as solubility enthalpies and entropies for $ULnO_4$ systems (Ln= Sm, Tb, Er, Ho, Tm, Yb). X-ray analyses confirmed the electrochemical measurements. The emf measurement system is checked by using binary oxides with known composition and oxygen partial pressure. A comparison between stabilities of analysed compounds is also presented.

57375 **(INIS-BR—33) Study on the damage caused by thermal shock and its recuperation in sintered high-alumina ceramics.** Devezas, T.C.; Madruga, T.P. (Instituto Militar de Engenharia, Rio de Janeiro (Brazil)). 1982. 13p. (In Portuguese). (CONF-821248—18). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83781130.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The influence of small concentrations of silica on the mechanical behavior of sintered high-alumina ceramics submitted to thermal shock in water was investigated. The theoretical predictions about the upgrading effects of this second phase were in good agreement with the experimental data. The recovery of damage induced by thermal shock was also studied by annealing the samples in the temperature range 800°-1600°C.

57376 **(INIS-BR—34) Fabrication of U_3O_8-Al dispersions.** de Figueredo, A.M.; Ferreira, P.I. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil). Centro de Metalurgia Nuclear). 1982. 11p. (In Portuguese). (CONF-821248—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781109.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The procedures used for the preparation by powder metallurgy of U_3O_8-Al dispersions, similar to those utilized in research nuclear reactors (MTR), are described in detail. Samples with U_3O_8 content varying from 0 to 80 wt.% were prepared. The influence of the U_3O_8 and Al powder characteristics, as well as the concentration of U_3O_8, in the various steps of fabrication are analysed. It is observed that the compressibility of the mixture U_3O_8-Al, and the degree of densification attained are dependent on the morphology, grit size, specific area and density of particles of the powder utilized.

57377 **(INIS-BR—36) Influence of the chemical composition and temperature in the mechanical behaviour of U_3O_8-Al cermets.** Ferreira, P.I.; de Figueredo, A.M. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil). Centro de Metalurgia Nuclear). 1982. 8p. (In Portuguese). (CONF-821248—19). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781131.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

U_3O_8-Al nuclear cermets, with U_3O_8 content varying from zero to 80 wt%, were prepared by rotary swaging of U_3O_8-Al compacts at 500°C. Specimens were fabricated from these materials and tensile tested at the temperatures 25°, 200°, 300° and 400°C at a strain rate of $4.3 \times 10^{-4} s^{-1}$. The yield stress $\sigma\Xi$ sub(E) and the ultimate tensile strength $\sigma\Xi$ sub(R), were analysed as a function of the test temperature and cermet composition. The results show that the dependence of $\sigma\Xi$ sub(E) and $\sigma\Xi$ sub(R) on composition can be explained in terms of the variation of the minimum load bearing cross-sectional area of the aluminum matrix with U_3O_8 concentration. The temperature dependence of $\sigma\Xi$ sub(R) and $\sigma\Xi$ sub(E) of the cermets was seen to be similar to the temperature dependence of these parameters of the aluminum matrix.

57378 **(INIS-BR—46) Study of structural behavior and oxidation kinetics of UO2 by high temperature X-Ray diffractometry.** Teixeira, S.R.; Imakuma, K. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil). Area de Processos Especiais). 1982. 11p. (In Portuguese). (CONF-821248—11). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781118.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The structural behavior of UO_2 sintered plates was studied as a function of temperature using X-ray diffractometry. The ther-

mal expansion coeeficient of UO sub(2,05) was determined and the structural transformation during isothermal oxidation was observed. The results favored an oxidation mechanism in which the rate-controling process was the diffusion of oxygen through the product layer of the new phase. Activation energies for the oxidation of UO_2 to UO sub(2,25) were found for different crystalographic planes (h, k, l). From this one can conclude that there is a preferential occupation of interstitial oxygen atoms within the UO_2 structure.

57379 **(INIS-BR—47) Preparation of thoria calcia solid electrolytes.** Muccillo, R. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil). Centro de Metalurgia Nuclear). 1982. 9p. (In Portuguese). (CONF-821248—12). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781119.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

The experimental procedures for the preparation of thoria-calcia solid electrolytes are described. Cold-pressed specimens presintered at 1400°C and sintered at 2000°C have been used for thermally stimulated depolarization currents measurements in the temperature range 100 K - 300 K as well as for ionic conductivity measurements in the temperature range RT - 900 K. The detection of a relaxation peak probably due to the reorientation of the Ca'' sub(Th) - V sup(..) sub(O) complex shows that solid solution has been attained. Preliminary results of electrical conductivity are also reported.

57380 **(JAERI-M—82-026) Thermal shock testing of low-Z coatings with pulsed hydrogen beams.** Nakamura, K. (Japan Atomic Energy Research Inst., Tokyo). Mar 1982. 25p. (In Japanese). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703721.

Thermal shock testing of candidate low-Z surface coatings for JT-60 application has been made by using a pulsed hydrogen beam apparatus which is operated at a power density of $2KW/cm^2$. The materials tested are PVD (Physical Vapor Deposited) TiC and PVD and CVD (Chemical Vapor Deposited) TiN on molybdenum and Inconel 625. The result shows that CVD TiC on Mo and CVD TiN on Inconel are the most interesting choices for the coating-substrate combinations.

57381 **(JAERI-M—82-090) Present status of chemical research progress on ceramics, 1. Some chemical aspects of Si_3N_4 and SiC.** Hirooka, Y.; Imai, H. (Japan Atomic Energy Research Inst., Tokyo). Jul 1982. 41p. (In Japanese). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703726.

Among silicon-based ceramics, silicon nitride and silicon carbide have generated considerable interest in recent years as potential materials for many high temperature engineering applications. Particularly in their dense high-strength forms, these materials are being proposed for use as structural materials, for instance, in HTGRs and in CTRs. Their potential usefulness and the maximum use temperature absolutely depend upon their chemical characteristics such as thermal stability and chemical reactivity against high temperature environment. There still remains, however, much room to investigate in chemistry of ceramics both in technological and academic aspects. From this point of view some chemical works mainly on silicon nitride, silicon carbide and supplementarily on their common oxide, silicon dioxide, are systematically reviewed and a prospect of the direction to which future research on these ceramics shall proceed is implied in this document.

57382 **(KFK—3375) Reaction-bonded silicon nitride.** Porz, F. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Material- und Festkoerperforschung; Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Maschinenbau). Oct 1982. 172p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751120.

Reaction-bonded silicon nitride (RBSN) has been characterized. The oxidation behaviour in air up to 1500°C and 3000 h and the effects of static and cyclic oxidation on room-temperature strength have been studied.

57383 **(LA-UR—83-2783) Radiation-induced rf loss measurements and thermal-stress calculations for ceramic windows.** Fowler, J.D. Jr. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-830942—40). NTIS, PC A02/MF A01. Order Number DE84001304.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Irradiation with high energy neutrons can cause increases in loss tangent and thermal resistivity for some ceramics. Loss tangents over the range 0.02 to several MHz have been measured for single and polycrystalline aluminum oxide and polycrystalline beryllium oxide, after irradiation with a spallation neutron source. Some samples of single crystal aluminum oxide were also irradiated with 14-MeV neutrons at RTNS-II to compare spectral effects. Significant increases in loss tangent were observed at the higher frequencies for the RTNS-II irradiated material. Numerical calculations of thermal stresses in rf windows, based on heating from dielectric losses and thermal conductivities, show that stresses can exceed measured fracture strengths in these materials.

57384 **(NIIAR—45(560)) Electroceramic materials for atomic power engineering.** Kostyukov, N.S.; Aver'yanov, P.G.; Antonova, N.P.; Dubinin, G.V.; Markina, N.V.; Raetskij, V.M. (Nauchno-Issledovatel'skij Inst. Atomnykh Reaktorov, Dimitrovgrad (USSR)). 1982. 8p. (In Russian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703728.

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Analyzed are the results from studies of the radiation resistance of electroceramic commercial materials and products. The radiation resistance was assessed according to the changes in these materials structure and in their mechanical, electrical and thermophysical properties during and after reactor irradiation by a maximum fluence of up to $4.2x10^{21}$ n/cm² (E > 0.1 MeV) within the temperature range from 60 to 600 deg C. Considered are the interrelation of the electric and mechanical strengths, the relationship between the strength characteristics and irradiation temperature, and the future investigation problems.

57385 **(PNL-SA—11544) Preparation and properties of electrically conducting ceramics based on indium oxide-rare earth oxides-hafnium oxides.** Marchant, D.D.; Bates, J.L. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 10p. (CONF-8309161—1). NTIS, PC A02/MF A01. Order Number DE84000150.

From Symposium on high temperature solid oxide electrolytes; Upton, NY, USA (16 Sep 1983).

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Electrically conducting refractory oxides based on adding indium oxide to rare earth-stabilized hafnium oxide are being studied for use in magnetohydrodynamic (MHD) generators, fuel cells, and thermoelectric generators. The use of indium oxide generally increases the electrical conductivity. The results of measurements of the electrical conductivity and data on corrosion resistance in molten salts are presented.

57386 **Auger-UPS study of intrinsic and Si-stabilized oxides of palladium.** Bader, S.D.; Richter, L.; Orent, T.W. (Argonne National Lab., IL). *Surface Science;* **115**: 501-512(1982).

Three types of oxide were identified that could persist in the subsurface region of Pd and be responsible for the known surface-property modifications that oxygen pretreatments induce in Pt-group metals. The identifications are based on Auger and HeI UPS studies of Pd(100), PdO and Pd_4Si. In particular, Si-stabilized oxides were detected via Auger spectroscopy for Pd(100) subjected to 800 to 1000°C in ~ 10^{-6} Torr O_2. These observations are similar to those recently reported by Niehus and Comsa, and Bonzel et al. for Pt single crystals. The Si, a bulk impurity, and oxygen were characterized by Auger signals at 78 and 506 eV, respectively, while O bonded to Pd has its Auger signal at 511 eV. Polycrystalline PdO exhibited a 2 eV crystal-field splitting of the O 2p emission, in UPS studies below 600°C, due to the tetragonal structure.

Above 600°C this splitting collapsed, due to thermal decomposition and a metastable O-trapped-in-Pd species was observed via UPS below 700°C. At 900°C a residual Si-stabiized oxide strikingly similar to that observed on Pd(100) was isolated. The UPS results for these Si-stabilized oxides and that formed by the room-temperature oxidation of Pd_4Si are compared. It is speculated that both SiO_2- and SiO-like species form at high and room temperature, respectively, for the O_2-Pd(Si) system. The role of oxygen pretreatments in modifying the chemisorption and catalytic properties of Pd are briefly discussed with respect to the three oxide species observed in this study: (1) PdO, (2) decomposed or collapsed PdO, and (3) Si-stabilized oxides.

3603 Composite Materials

57387 **(UCID—19881) Overview of composites capability at Lawrence Livermore National Laboratory.** Lepper, J.K. (Lawrence Livermore National Lab., CA (USA)). 30 Aug 1983. Contract W-7405-ENG-48. 21p. NTIS, PC A02/MF A01. Order Number DE84001086.

LLNL has had a polymer matrix fiber composite research and development activity for over twenty years. LLNL has an active multidisciplined team investigating all aspects of polymer matrix fiber composites. This is a unique national resource because it is a total capability from the synthesis of new materials to the manufacture of final products. We have concentrated our research and development efforts on high performance structural composites. The materials are used in critical components requiring service reliability certifications of from 10^{-3} to 10^{-6} failure probabilities. Many of these components are designed to function in severe service environments for more than twenty-five years. Our approach to accomplishing these objectives has been to establish a very large and sound data base. Using this data base we have developed a fundamental understanding of glass, graphite, and aramid fibers, epoxy and polyimide matrices, and their high performance structural composites.

3604 Polymers And Plastics

57388 (HMI-B—370, pp 175) **Structural investigations of polyacetylene and polyphenylene by neutron scattering.** Stamm, M.; Hocker, J.; Axmann, A. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57389 **(SAND—82-2903C) Finite-element analysis of an epoxy-curing process.** Gartling, D.K.; Hickox, C.E.; Nunziato, J.W. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 6p. (CONF-8309149—1). NTIS, PC A02/MF A01. Order Number DE84000452.

From 5. international conference on finite elements; Austin, TX, USA (26 Sep 1983).

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A finite element numerical procedure is used to study the curing of an epoxy compound. The problem involves the gelation of an incompressible liquid due to an exothermic chemical reaction. Nonuniform temperature fields produce buoyancy-driven fluid motions that interact with the solidifying material. The numerical simulations provide temperature histories and the progression of the gel front that are compared with experimental data.

3606 Other Materials

REFER ALSO TO CITATION(S) 56966, 56973, 56978, 57132, 57145, 57374, 57522

57390 **(BMFT-FB-T—83-048) Influence of ion irradiation on the magnetic properties of ferrimagnetic films.** Hansen, P.; Heitmann, H.; Strocka, B. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). Apr 1983. 180p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751134.

With 62 figs., 1 tab. and 48 refs.

A new technology to influence the material properties and for structuring magneto-optic garnet films by irradiation with heavy ions of high energy is described. High energy heavy-ion irradiation of nonconducting solids leads to the formation of nuclear tracks of diameter 5 to 20 nm and a length of some 10 μm. In the track volume the crystallographic and magnetic order is almost completely destroyed. The material properties (lattice constant, magnetization, hyperfine field, anisotropy, Faraday rotation, optical absorption, FMR linewidth) of the investigated ferrimagnetic garnet films thus are strongly influenced by the magnitude and number of these nuclear tracks. In the present work the dependence of the mentioned properties on the irradiation conditions (energy, mass, dosage) is presented. In addition, the etching and annealing behaviour of the nuclear tracks induced by the heavy-ion irradiation is reported. From these basic results new methods to influence the material properties and for structuring processes can be deduced. The resulting possibilities for technical applications are discussed.

57391 **(EUR—8630-FR) Application of microwave heating and hot air for the continuous production of plasticized PVC sheets. Final report.** Roussel, A.; Haag, L. (Eurofloor S.A., Luxembourg). 1983. 15p. (In French and English). European Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037.

A microwave tunnel has been achieved for continuous gelling and foaming of plasticized PVC sheets. The reason for this choice is the poor efficiency of the hot air pulsed heater. The microwave tunnel is made of 6 wave guides of 1 KW each. The plasticized PVC sheet with blowing agent is foamed very quickly, but unfortunately in a nonuniform way. One of the reasons for this bad blowing is the nonuniform repartition of the energy caused perhaps by the choice of the waveguide. Another reason is the slight understanding of all the physical, thermal and microwave properties of the plasticized PVC. The addition of hot air during the blowing process did not permit to find the correct foaming of the sheet. Some formulations with different additives (silica, aluminum hydroxide, carbon black and different plasticizers) were also tried, but again without success. No harmless polar additives having a good compatibility with PVC and increasing the microwave reactivity of the plastisol could be found up to now.

57392 (HMI-B—370, pp 3-9) **Neutron scattering study of the short range and long range magnetic order in TMNB.** Knop, W.; Steiner, M.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

Neutron diffraction experiments of the short-range and long-range magnetic order in $(CH_3)_4NNiBr_3$ (TMNB) are reported. The observed magnetic peaks are explained by a magnetic domain structure.

57393 (HMI-B—370, pp 10-15) **Neutron inelastic scattering study of transverse spin fluctuations in $CsNiF_3$.** Pynn, R.; Kjems, J.K.; Steiner, M.; Kakurai, K.; Knop, W. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

Neutron inelastic scattering studies are done on transverse spin fluctuations in $CsNiF_3$. A three peak structure is observed due to spin-wave creation and annihilation. Single spin wave scattering, two spin wave scattering and scattering from solitons are discussed.

57394 (HMI-B—370, pp 24-55) **Extinction effects in the mixed phase region of $DyPO_4$.** Millhouse, A.H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The metamagnetic system $DyPO_4$ is investigated by magnetic Bragg neutron diffraction reflections. Mainly the antiferromagnetic reflections are treated.

57395 (HMI-B—370, pp 61-68) **Observation of two-magnon scattering in $CsNiF_3$.** Hirakawa, K.; Reiter, G.; Shirane, G.; Steiner, M. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

An inelastic neutron scattering study of $CsNiF_3$ is performed in an external field for finite energy transfer. Thus the contribution of two magnon processes to the inelastic neutron cross-section is determined by applying an extension of the linear spinwave theory.

57396 (HMI-B—370, pp 69-76) **Observation of hyperfine-enhanced nuclear polarisation on CoF_2 by means of neutron diffraction.** Wanklyn, B.; Steiner, M.; Bevaart, L.; Ajiro, Y.; Millhouse, A.J.; Ohlhoff, K.; Rahn, G.; Dachs, H.; Scheer, U. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

We have observed by means of neutron diffraction significant nuclear polarisation of the ^{59}Co-nuclei in CoF_2 after about 40 h cooling at 12 mK corresponding to a nuclear temperature of 19 mK. This demonstrates that by the use of modern dilution refrigerators sufficient nuclear orientation can be achieved to make the nuclear structure factor Fsub(nuc) temperature dependent. This temperature dependence can be detected in standard neutron diffraction experiments even for insulating transition metal compounds. Thus it appears possible to use transition metal ions and their hyperfine field-induced nuclear polarisation to solve structural problems.

57397 (HMI-B—370, pp 77-81) **Magnetic ordering in the random mixture CaMnsub(1-X)Cosub(X)Cl_3x2H_3O.** Ajiro, Y.; Yamamoto, I.; Steiner, M.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The magnetic ordering of the random mixtures CaMnsub(1-x)Cosub(x)Cl_3x2H_3O is studied by neutron diffraction. The mixture is composed of two antiferromagnets whose spin easy-axes are perpendicular to each other. A new magnetically ordered phase exists called oblique antiferromagnetic phase (OAF). For clarifying the existence of the OAF phase neutron diffraction experiments are done.

57398 (HMI-B—370, pp 82-91) **Investigations of the magnetic properties of MnOOH by means of elastic and inelastic neutron diffraction.** Kasper, F.; Dachs, H.; Axmann, A. Jan 1982. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

For MnOOH the dispersion relations of the magnons are determined by neutron spectroscopy. For T=13 K a splitting of the magnons into two branches is found. Model calculations are performed for isotropic Heisenberg exchange interactions.

57399 (HMI-B—370, pp 92-106) **Neutron and X-ray studies of $CsNiFeF_6$ and $CsMnFeF_6$ single crystals.** Wanklyn, B.M.; Krasnicki, S.; Steiner, M.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The magnetic behaviour and the crystal structure of $CsNiFeF_6$ and $CsMnFeF_6$ single crystals is investigated by neutron scattering and X-ray diffraction.

57400 (HMI-B—370, pp 107-115) **Compton profile measurements on $Mg(OH)_2$, and the electron distribution in the OH^--ion.** Pattison, P.; Hansen, N.K.; Schneider, J.R. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

Compton profile measurements are performed on $Mg(OH)_2$ ionic crystals. From the anisotropy of the profile the electronic configuration of the OH-group is described.

57401 (HMI-B—370, pp 129-131) **X-ray diffraction study of MnF_2.** Jauch, W.; Schneider, J.R.; Dachs, H. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The aim of the investigation is to check whether the structural parameter of the rutile type crystal MnF_2 exhibits a small temperature shift. Then the origin of the temperature dependence of the optical birefringence of MnF_2 could be explained. γ-ray diffraction is used because of the high accuracy of the method.

57402 (HMI-B—370, pp 141-144) **Observation of critical phenomena in PTP by incoherent neutron scattering.** Toudic, B.; Cailleau, H.; Lechner, R.E. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

In Reports of the study group for neutron scattering.

The molecular conformations around the structural antiferroreorientational phase transition in para-terphenyl is investigated by incoherent neutron scattering. The order parameter is studied and its temperature dependence is described.

57403 (HMI-B—370, pp 145-146) **Dynamics of molecular conformation near the order-disorder transition in PTP.** Toudic, B.; Lechner, R.E. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57404 (HMI-B—370, pp 147-150b) **Ferroelectric fluctuation in KD_2PO_4.** Cowley, R.A.; Nelmes, R.J.; Bleif, H.J. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57405 (HMI-B—370, pp 156-162) **Neutron topography and neutron optics.** Treimer, W.; Seifert, R.; Gaehler, R.; Shull, C.G.; Zeilinger, A. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57406 (HMI-B—370, pp 165-166) **Neutron diffraction investigations for the determination of NaCl textures.** Brokmeier, H.G.; Brehler, B. Jan 1982. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57407 (HMI-B—370, pp 167-168) **Neutron diffraction experiments for ternary selenides.** Bronger, W.; Mueller, P.; Kyas, A. Jan 1982. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57408 (HMI-B—370, pp 169-172) **Experimental determination of the static Debye-Waller factor for the system NbD.** Behr, H.; Burkel, E.; Peisl, J. Jan 1982. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57409 (HMI-B—370, pp 173-174) **Neutron diffraction study of $MnSe_2$.** Plumier, R.; Steiner, M. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57410 (HMI-B—370, pp 176-177) **Temperature dependence of the compressibility of d_8-naphthalene.** Jordan, J.F.F.; Egger, H.; Kalus, J.; Axmann, A. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.
In Reports of the study group for neutron scattering.

57411 (INIS-mf—8560, pp vp) **Effect of magnetic field on transition of U_3As_4 to single-domain state.** Zeleny, M. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).
Published in summary form only.

57412 (INIS-mf—8560, pp vp) **Effect of etching on surface properties of CdTe single crystals.** Kuzel, R.; Hung, N. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).
Published in summary form only.

57413 (INIS-mf—8575, pp vp) **Moessbauer study of natural and synthetic Wolframites.** Guillen, R.; Regnard, J. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57414 (INIS-mf—8575, pp vp) **Electron paramagnetic resonance of Cr, V, and P centers in natural topaz.** Hafner, S.; Petrov, I.; Rager, H. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57415 (INIS-mf—8575, pp vp) **Moessbauer study of grunerite.** Linares, J.; Regnard, J. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57416 (INIS-mf—8575, pp vp) **Moessbauer study of green tremolite occuring in chromite amphibolites from Bichhaburn, Singhbhum dt., Bihar, India.** Mitza, S. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57417 (INIS-mf—8575, pp vp) **Synthesis and x-ray structural investigation of cadmium and lithium borates.** Sokolova, E.; Simonov, M.; Belov, N. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57418 (INIS-mf—8575, pp vp) **High resolution neutron diffraction study of synthetic fergusonite and a yttrium niobate of composition Y_3NbO_7.** Barker, N.; Graham, J. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57419 (INIS-mf—8575, pp vp) **Spectroscopic properties of transition.** Calas, G. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57420 (INIS-mf—8575, pp vp) **Crystal structure of rare earth borates.** Belokoneva, L.; Timchenko, T.; Belov, N. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57421 (Juel—1817) **Moessbauer studies of the magnetic hyperfine interactions of ^{151}Eu in europium monochalcogenides with application of high pressures and high magnetic fields.** Zaker, A.M. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). Dec 1982. 75p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751287.

In this work the Moessbauer effect on the 21.6 keV γ-transition of ^{151}Eu has been used to investigate the pressure dependence of the magnetic hyperfine interaction in the ferromagnetically saturated phase of EuS, EuSe and EuTe applying simultaneously high pressure up to 20 kbar and high external magnetic fields of about 12 T. Moreover, we have studied the effects of pressure on the core polarization field Bsub(c) of the Eu^{2+} ion in the magnetic dilution system Eusub(x)Srsub(1-x)S. The following results of our experiments are of particular interest: 1) The magnetic hyperfine (hf) fields Bsub(I) in the ferrogmagnetically saturated state of EuS, EuSe and EuTe do not respond very sensitively to applied pressures up to 20 kbar, in contrast to EuO. 2) The pressure dependence of Bsub(I) for EuS, EuSe and EuTe predominantly reflects the pressure dependence of the hf field contributions B_1 transferred from the nearest Eu^{2+} neighbours. The contributions B_2 transferred from the next nearest Eu^{2+} neighbours are concluded to be much less pressure dependent and negligible. 3) The core polarization field Bsub(c) induced by the Eu^{2+} ion's own 4f moment is nearly independent of pressure up to 20 kbar, at least for EuS.

57422 (Juel—1831) **Fracture mechanics tests in static and cyclic loading conditions on structure graphite for high temperature reactor plants.** Thiele, W.; Delle, W.; Schubert, F.; Nickel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). Mar 1983. 102p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751170.

Fracture mechanics tests have been carried out on nuclear reactor graphites manufactured by extrusion or by vibration moulding. In addition to the measurement of fracture thoughness in static tests, cyclic tests with a sinusoidal load in the range for pulsating tensile stresses were carried out. The crack propagation rate was determined as a function of the stress intensity factor range. The anisotropic fracture behaviour observed in both static and cyclic tests was correlated with the anisometrical form of the pores identified during the investigation of the graphite morphology by means of the quantitative image analysis.

57423 **Effects of surface area to solution volume ratio and surface roughness on glass leaching.** Buckwalter, C.Q.; Pederson, L.R.; McVay, G.L. (Pacific Northwest Lab., Richland, WA). *Journal of Non-Crystalline Solids;* **49**: No. 1-3, 397-412(May 1982). Contract AC06-76RL01830.

The effects of surface roughness on the leaching characteristics of both a simple borosilicate and a soda-lime-silicate glass were evaluated by using five different surface preparations with a constant sample surface area to leachate volume ratio (SA/V). For the borosilicate glass, corrosion rates were accelerated as a result of surface roughness by much more than the percentage increase in surface area, but they were approximately equal to the surface area increases for the soda-lime-silicate glass. Opposite trends in the amount of selective leaching with changes in surface roughness occurred with the two glasses, in which surface layer accumulations of insoluble components played a key role. The effects of varying SA/V on leaching characteristics were evaluated for a simple borosilicate glass by using five different SA/V values for one surface

preparation. Except for Si, increasing SA/V ratios resulted in both an increase in the leachate pH and a decrease in the total elemental removal. The net effect was a thinner depletion layer with larger SA/V ratios. These results are compared to those for simple silicate glasses found in the literature.

57424 **Diffusion to the surface in the annealing of radiation damage in inorganic insulating solids.** Ritter, W.; Maerk, T.D. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. fuer Kernphysik und Gaselektronik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Absorption spectroscopy is used for the investigation of fission track radiation damage in inorganic insulating solids. Extending previous studies from this laboratory we have measured the characteristic absorption difference as a function of annealing temperature and sample dimension in fluorapatite. From these studies it was possible to obtain quantitative information about the identity of the microscopic elementary processes responsible for the annealing of radiation damage induced lattice defects: the dominant annealing process for the absorbing defects is diffusion to the surface with a measured diffusion coefficient of $D = (3.2 +- 0.4) \cdot 10^{-9}$ cm²/s (at T = 673K) perpendicular to the c-axis.

57425 **STEM and EELS analysis of multiphase microstructures in oxide and non-oxide glasses.** Risbud, S.H. (Univ. of Illinois, Urbana). *Journal of Non-Crystalline Solids;* **49**: 241-251(1982). Contract AC02-76ER01198.

The techniques of scanning transmission electron microscopy (STEM) and electron energy loss spectroscopy (EELS) were used to perform microstructural and semiquantitative microchemical analyses of multiphase microstructures developed in bulk glasses by liquid immiscibility processes. Bulk glass samples were prepared in the systems Si-Al-O, Cd-Ge-Si-As, Pb-Al-Ti-Si-O, and Si-Na-B-O-N, using synthesis procedures appropriate to each system. Representative compositions which exhibited a multi-phase glass microstructure in the transmission electron microscope (TEM) were selected for the STEM and EELS microchemical analysis. Glasses in all the systems always showed a microstructure of glass droplets (varying in size from ~ 5 to ~ 40 nm) dispersed in a glass matrix. The microstructure of the Pb-Al-Ti-Si-O glass showed two droplet phases (~ 5 nm and ~ 25 nm in diameter) embedded in a glass matrix. The results of the microchemical analysis are correlated with available liquid miscibility gap information, particularly in the Al-Si-O system.

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REFER ALSO TO CITATION(S) 56845, 56928, 56942, 57365, 57798, 57801

57426 **(CONF-8309133—2) Electron-energy-loss spectral library and its application to materials science.** Zaluzec, N.J. (Argonne National Lab., IL (USA)). Sep 1983. Contract W-31-109-ENG-38. 5p. NTIS, PC A02/MF A01. Order Number DE84000588.

From 10. international congress on X-ray optics and microanalysis; Toulouse, France (5 Sep 1983).

An electron energy loss spectral library can be an invaluable tool in materials research from a fundamental as well as a practical standpoint. Although it will not alleviate all the complications associated with quantification, this type of library can help to elucidate details of spectral profiles previously found intractable. This work was supported by the US Department of Energy. The author also wishes to express his gratitude to the organizing committee for partial financial support provided to attend this meeting.

57427 **(DOE/ER/04073—13) Chelating extractants of improved selectivity. Progress report, August 1, 1982-July 31, 1983.** (Arizona Univ., Tucson (USA)). Jul 1983. Contract AC02-76ER04073. 6p. (COO—473-13). NTIS, PC A02/MF A01. Order Number DE84001280.

During the current contract year, attention was particularly focussed on the aroylphenylhydroxylamine family of chelating extractants. Extraction equilibria for selected tervalent metal ions with several halogenated acylpyrazolones, benzoylphenylhydroxylamine (BPHA) and several congeners were determined. The results indicate significantly improved selectivity for fluorine substituted derivatives of BPHA. An improved two phase acid-base titration procedure for the determination of equilibrium extraction parameters of weakly acidic extractants was developed.

57428 **(DOE/ER/71013—T3) Laser-induced fluorescence spectroscopy for improved chemical analysis.** Gelbwachs, J.A. (Aerospace Corp., Los Angeles, CA (USA). Chemistry and Physics Lab.). Sep 1983. Contract AT03-76ER71013. 14p. NTIS, PC A02/MF A01. Order Number DE84000629.

This report summarizes the progress achieved over the past five years in the laser-induced fluorescence spectroscopy (LIFS) for improved chemical analysis program. Our initial efforts yielded significantly lower detection limits for trace elemental analysis by the use of both cw and pulsed laser excitations. New methods of LIFS were developed that were shown to overcome many of the traditional limitations to LIFS techniques. LIFS methods have been applied to yield fundamental scientific data that further the understanding of forces between atoms and other atoms and molecules. In recent work, two-photon ionization was combined with LIFS and applied, for the first time, to the study of energy transfer in ions.

57429 **(DOE/ER/71013—T5) Laser-induced-fluorescence spectroscopy for improved chemical analysis. Progress report, 1978-1983.** Gelbwachs, J.A. (Aerospace Corp., Los Angeles, CA (USA). Chemistry and Physics Lab.). Sep 1983. Contract AT03-76ER71013. 69p. NTIS, PC A04/MF A01. Order Number DE84000686.

This report summarizes the progress achieved over the past five years in the laser-induced-fluorescence spectroscopy (LIFS) for improved chemical-analysis program. Our initial efforts yielded significantly lower detection limits for trace elemental analysis by the use of both cw and pulsed-laser excitations. New methods of LIFS were developed that were shown to overcome many of the traditional limitations to LIFS techniques. LIFS methods have been applied to yield fundamental scientific data that further the understanding of forces between atoms and other atoms and molecules. In recent work, two-photon ionization was combined with LIFS and applied, for the first time, to the study of energy transfer in ions.

57430 **(DOE/ER/71013—T6) Laser-induced-fluorescence spectroscopy for improved chemical analysis. Progress report, 1978-1983.** Gelbwachs, J.A. (Aerospace Corp., Los Angeles, CA (USA). Chemistry and Physics Lab.). Sep 1983. Contract AT03-76ER71013. 13p. NTIS, PC A02/MF A01. Order Number DE84001192.

This report summarizes the progress achieved over the past five years in the laser-induced fluorescence spectroscopy (LIFS) for improved chemical analysis program. Our initial efforts yielded significantly lower detection limits for trace elemental analysis by the use of both cw and pulsed laser excitations. New methods of LIFS were developed that were shown to overcome many of the traditional limitations to LIFS techniques. LIFS methods have been applied to yield fundamental scientific data that further the understanding of forces between atoms and other atoms and molecules. In recent work, two-photon ionization was combined with LIFS and applied, for the first time, to the study of energy transfer in ions.

57431 (DP-MS—83-44) Analyses of nuclear fuel and high-level waste by inductively coupled plasma-emission spectroscopy. Coleman, C.J. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 8p. (CONF-831025—10). NTIS, PC A02/MF A01. Order Number DE84001592.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

Containment of the inductively coupled plasma (ICP) source has increased the application of ICP emission spectroscopy at the Savannah River Laboratory (SRL). Nuclear materials are analyzed for up to 41 elements simultaneously with an ICP polychromator detection system. This technique is used for determining trace impurities in uranium that can adversely affect nuclear fuel processing. Uranium samples, after solvent extraction removal of uranium to reduce spectral interferences, are satisfactorily analyzed for impurity elements. ICP emission spectroscopy is also effective for analyzing sludge from the Savannah River Plant (SRP) high-level waste tanks. Methods were developed for analyzing a wide range of sludge compositions for major and minor elements. ICP analyses of waste tank sludge are required for SRP defense waste solidification programs. Method development and analyses of typical samples will be presented.

57432 (DP-MS—83-57) State-of-the-art mass spectrometer system for determination of uranium and plutonium isotopic distributions in process samples. Polson, C.A. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant). 1983. Contract AC09-76SR00001. 9p. (CONF-831025—4). NTIS, PC A02/MF A01. Order Number DE84001408.

From 26. ORNL-DOE conference on analytical chemistry in energy technology; Knoxville, TN, USA (11 Oct 1983).

A Finnigan MAT 261 automated thermal ionization mass spectrometer system was purchased by the Savannah River Plant. The MAT 261 is a highly precise, fully automated instrument. Many features make this instrument the state-of-the-art technology in precision isotopic composition measurements. A unique feature of the MAT 261 is the ion detection system which permits measurement of the three uranium or plutonium masses simultaneously. All Faraday cup measuring channels are of the same design and each is equipped with a dedicated amplifier. Each amplifier is connected to a linear voltage/frequency measuring system for ion current integration. These outputs are fed into a Hewlett-Packard 9845T desktop computer. The computer, and the Finnigan developed software package, control filament heating cycles, sample preconditioning, ion beam focusing, carrousel rotation, mass selection, and data collection and reduction. Precision, accuracy, and linearity were determined under normal laboratory conditions using a NBS uranium suite of standards. These results along with other development in setting up the instrument are presented.

57433 (GKSS—83/E/6) Activation analysis by γ spectroscopy after cyclic irradiation with 14 MeV neutrons, illustrated by the example of the $^{19}F(n,p)^{19}O$ reaction. Rybaczok, P. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). 1983. 88p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751138.

Diploma thesis submitted to Technische Univ. Berlin (Germany, F.R.). With 33 figs., 10 tabs.

In the present work the concentrations of fluorine in human tooth and other materials have been determined by 14 MeV neutron activation analysis. For analytical work short-lived indicator nuclides have been used. The effects of matrix activity, which is high for natural samples, have been discussed and a solution has been worked out. Various functions have been tried for the interpolation of the efficiency values of Ge(Li)-detectors. For a cylindrical neutron tube the flux distribution and flux averaged on the sample volume have been formulated and numerically calculated.

57434 (HMI-B—370, pp 151-155) Theoretical investigation of partially phased Fourier maps in the presence of experimental errors. Jauch, W. Jan 1982. NTIS (US Sales Only), PC A10/MF A01. Order Number DE83902388.

Published in summary form only.

In Reports of the study group for neutron scattering.

57435 (INIS-BR—24) Thermodynamics of uranium and nitric acid extraction from aqueous solution of TBP/diluent. de Souza Freitas, R.F. (Minas Gerais Univ., Belo Horizonte (Brazil). Escola de Engenharia). Jun 1982. 104p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781096.

A thermodynamically consistent procedure for predicting distribution equilibria for uranyl nitrate and nitric acid between an aqueous solution and 30 vol % tributyl phosphate (TBP) in a hydrocarbon diluent is studied. Experimental work is developed in order to obtain equilibrium data for the system uranyl nitrate, nitric acid, water and 30 vol % TBP in n-dodecane, at 25°C and 40°C. The theoretical equilibrium data, obtained with the aid of a computer, are compared with the experimental results.

57436 (INIS-BR—32) Study of the occurrence of synergic effect in the extraction of uranium from nitric and sulphuric acid solutions by mixtures of tri-N-butyl phosphate and di - (2 - ethylhexyl) phosphoric acid. Ai, S. (Instituto de Pesquisas Energeticas e Nucleares, Sao Paulo (Brazil)). 1982. 121p. (In Portuguese). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781099.

The study of synergic effect arising when uranium(VI) is extracted from nitric and sulphuric acid solutions by a mixture of tri-n-butyl phosphate (TBP) and di-(2-ethylhexyl) phosphoric acid (HDEHP) is presented.

57437 (KFK—3502) Development of an analytical method for the determination of U-238, U-234, Th-232, Th-230, Th-228, Ra-228, Ra-226, Pb-210 and Po-210 and its application on environmental samples. de Oliveira Godoy, J.M. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Feb 1983. 176p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751107.

A comparison between the environmental impact by nuclear facilities with the burden suffered from natural radioactivity calls for studying the long-lived radionuclides of the U-238 and Th-232 decay series U-238, U-234, Th-232, Th-230, Th-228, Ra-228, Ra-226, Pb-210 and Po-210. This work describes the development of a fast isotope dilution analysis method allowing to separate with one sample solution U, Th, Ra, Pb and Po both from each other and, at the same time, from the matrix. To test its applicability, the method was used with samples consisting of soil, sediments, plants, water, carbon and air dust filter. The detection limit for the chemical yield attained of approx. 70% was 0.27 mBq per sample for Th-232, Th-230, Th-228, U-238, U-234 and Po-210. The detection limit for Pb-210 was 10 mBq per sample. On account of the influence by Ra-226 in the Ra-228 measurement and vice versa the detection limit is a function of the Ra-226 and Ra-228 concentrations, respectively, in the sample. The detection limits for the pure nuclides are 0.9 mBq per sample and 10 mBq per sample, respectively, for Ra-226 and Ra-228.

57438 (KFK—3510) Determination of Pu-241 by liquid scintillation counting in gaseous effluents of an incineration facility, FERAB, and the Karlsruhe Nuclear Reprocessing Plant, WAK. Godoy, J.M.; Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Mar 1983. 26p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751144.

Although the concentration of Pu-241 in nuclear fuel to be reprocessed is high, there are only few results published about the emission of Pu-241 with gaseous and liquid effluents. Nearly no information is available, too, about the environmental contamination of nuclear installations by Pu-241. Therefore a procedure was developed to measure Pu-241 by liquid scintillation counting. Sample preparation was performed by electroplating of plutonium on stainless steel planchets. To correct the self-absorption the linear dependence of counting efficiency in the liquid scintillation counter and the resolution in the α-spectrometer was used.

57439 Controlled-potential coulometric determination of plutonium with concurrent correction for a second reversible couple. Application to solutions containing plutonium and iron or neptunium. Holland, M.K.; Lewis, K. (USDOE New Brunswick Lab., Argonne, IL (USA)). *Analytica Chimica Acta;* **149**: 167-173(1 May 1983).

The controlled-potential coulometric determination of plutonium with a concurrent measurement of an interfering reversible couple is described. Sample electrolysis over two different potential spans is used. The Nernst equation is utilized to determine the fraction electrolyzed for the plutonium and the interfering reversible couple for each potential span. Two linear equations, in two variables, each containing the appropriate data from one of the sample electrolyses are solved simultaneously for the quantities of plutonium and interfering reversible couple present. Appropriate background current corrections are discussed. This concurrent measurement technique has been applied to the determination of plutonium in solutions containing either plutonium and iron or plutonium and neptunium with a reliability of better than 0.1% for plutonium.

57440 Determination of trace elements in human hair of population near a Chilean copper smelter. Aveggio Bacigalupo, F.; Lagomarsino Burger, G.; Rojas Roman, E. Valparaiso, Chile; Valparaiso University, Escuela de Quimica y Farmacia (1982). 169p. (In Spanish). Available from Comision Chilena de Energia Nuclear, Santiago (Chile).

Levels of trace elements were measured in scalp hair from three different population groups, resident of areas within 8 kms. of a copper refinery and resident of rural and urban areas living within 30 to 70 kms. of the copper smelter. The trace elements analyzed herein are: Ag, As, Br, Co, Cr, Fe, Sb and Zn, that were evaluated by means of instrumental neutron activation analysis. Pb was analyzed by atomic absorption spectrometry. The significant differences between the arithmetic means obtained for each population were evaluated using the student's test, finding statistically significant differences for some elements, although only arsenic presents toxicologic risk levels, that in the future would be able to lead to chronic toxicity.

57441 Basic problems associated with the interpretation of the fluorescence spectra in Doppler-shift laser spectroscopy. Thomsen, K.; Husinsky, W.; Betz, G. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The influence of power broadening and the interpretation of the measured fluorescence spectra as being proportional to the flux or density in Doppler-shift laser fluorescence spectroscopy using cw-dye laser excitation are discussed. Power broadening was found to be negligible for the measurement of energy spectra of sputtered species and in the low energy regime (below several 1000m/s) the measured fluorescence signal of Na was found to be proportional to the flux.

57442 Thorium determination by X-ray fluorescence spectrometry in Thorex process solutions. Yamaura, M. Sao Paulo, Brazil; Instituto de Pesquisas Energeticas e Nucleares (1982). 101p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

The X-ray fluorescence method for thorium determination in aqueous and organic (TBP/n-dodecane) solutions is described. The thin film technique for sample preparation and a suitable internal standard had been used. The best conditions for thorium determination had been established studing some parameters as analytical line, internal standard, filter paper, paper geometry, sample volume and measurement conditions. With the established conditions, thorium was determinated in aqueous solutions with 1% precision in the concentration range of 1 to 200 gTh/L and in organic solutions (2-63 Th/L) with 1,5% of precision. The accuracy of the proposed method was 3% in aqueous and organic phases. The detection limit was 1,2 μg thorium for aqueous solutions and 1,4 μg for organic solutions. Uranium, fission products, corrosion products and Thorex reagent components were studied as interfering elements in the thorium analysis. The matrix effect was also studied using the Thorex process simulated solutions. Finally, the method was applied to thorium determination in irradiated thorium solutions with satisfactory results.

57443 Analytical control of zirconium and hafnium separation process. Iha, C. Sao Paulo, Brazil; Instituto de Pesquisas Energeticas a Nucleares (1982). 117p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

A study on analytical control of Zr and Hf separation process is described. The determination of thiocyanate ion in chloride medium by precipitation as cuprous thiocyanate, and determination of Zr and Hf by precipitation as mandalates and ignition to oxide were standardized. The analysis of Zr and Hf by X-ray fluorescence method were studied. The thin film technique for sample preparation was used by deposition of precipitate on the Filtre paper. The K sub(α) line of Zr and L sub(β1) line of Hf were used for analysis. The behaviour of fluorescence intensity ratio to the correspondent mass ratios of Zr and Hf were studied. The direct determination of Hf in concentration between 2 to 95% in the samples without any separation was studied. For Hf concentration lower than 2%, a method for its enrichment and determination was standardized. Using this technique the Hf concentration up to 1000 ppm has been determined.

57444 Methods for the analysis of ores, rocks and related materials. Donaldson, E.M. Ottawa, Canada; Canadian Government Publishing Centre (1982). 584p. Canadian Government Publishing Centre, Supply and Services Canada, Ottawa, Canada K1A 0S9 $33.60.

This manual, which covers uranium ores as well as other types of ores, is divided into six sections dealing with: atomic absorption spectrophotometric and flame emission photometric methods, light-absorption spectrophotometric methods, fluorimetric methods, gravimetric methods, and volumetric methods.

57445 (DP-tr—48) Extractive phase distribution of uranyl nitrate with tri-(n-butyl)phosphate. Part I. The $UO_2(NO_3)_2$-TBP-H_2O-HNO_3 system. Kanellakopulos, B.; Dressler, P.; Ertel, D. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA); Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Hochtemperatur-Chemie). 1982. Contract AC09-76SR00001. Translation of KfK 3351. 36p. NTIS, PC A03/MF A01. Order Number DE84001406.

Portions are illegible in microfiche products.

The distribution coefficients of UO_2^{++} in the system $UO_2(NO_3)_2$-TBP-H_2O-HNO_3 have been measured for small uranium concentrations (from 10^{-2} to 10^{-5} moles/liter) and for HNO_3 concentrations from 0.0 to 12.4 moles/liter in the aqueous phase.

57446 Liquid-liquid chromatography fractionation of organic compounds in complex mixtures: application to automobile exhaust. Colgrove, S.G. Iowa City, IA; Iowa State Univ. (1980). 301p. L;81-03,438.

Thesis (Ph. D.).

A liquid-liquid fractionation method based upon well-known chemical reactions has been developed. With the use of the fractionation method, a mixture of organic compounds can be separated into strong acid, weak acid, base, aldehyde, ketone, "polar," and "nonpolar" fractions. Organic compounds, representing several chemical classes, were used to determine how much material would be lost during the fractionation and to determine how well the various compound types could be separated from each other. Most of the compounds tested were recovered in yields which were sufficient to provide good qualitative and quantitative data. Problems relating to impurities introduced into samples by solvents and reagents were examined. In addition, some reactions which led to the formation of artifacts were investigated. The advantages of using the liquid-liquid fractionation method as a preseparation method for GC/MS were shown for the analysis of real samples, including gasoline, diesel fuel, and exhaust from internal combustion engines using those fuels.

4002 Inorganic And Physical Chemistry

REFER ALSO TO CITATION(S) 56819, 57004, 57485, 57760

57447 (DOE/ER/71015—3) Catalytic oxidations using transition-metal carbonyls. Roundhill, D.M. (Washington State Univ., Pullman (USA). Dept. of Chemistry). 1981. Contract AT06-76ER71015. 23p. NTIS, PC A02/MF A01. Order Number DE84001170.

During the past year we have been working primarily on four separate projects, all of which are related to our goal of discovering new science which will allow development of new homogeneous catalysts for selective oxidations of hydrocarbons. These four projects are: the $Re_2(CO)_{10}$ photocatalyzed decomposition of hydrogen peroxide, the oxidative decarbonylation of an iridium carbonyl complex having a phosphine amine chelate ligand, the elucidation of mechanistic pathways and the detection of carbonylrhodium intermediates in the $Rh_6(CO)_{16}$ catalyzed-co-oxidation of CO and triphenylphosphine, and synthesis and chemistry of new d^6 and d^8 transition metal complexes having hydroxo or oxo liganda.

57448 (DOE/MC/19233—1472) Surface characterization of contaminant reactants covering the period June 14, 1982-June 14, 1983. Siriwardane R.V. (West Virginia Univ., Morgantown (USA). Dept. of Chemical Engineering). 1983. Contract AT21-82MC19233. 24p. NTIS, PC A03/MF A01. Order Number DE83017965.

Interactions of gaseous NO and SO_2 with Al_2O_3, SiO_2, and iron deposited on SiO_2 were carried out at temperatures 298, 473, and 673K. X-ray photoelectron spectroscopy (XPS) was used in the analysis. Pure Al_2O_3 and SiO_2 did not show any reaction with either NO or SO_2 at any of the three tenperatures. Iron was depoeited on SiO_2 in the metallic state. Both gases interacted with the Fe/SiO_2 system. Interaction increased with increasing iron deposition. Two forms of nitrogen were observed when NO was exposed to the Fe/SiO_2 system at 298K. They were identified as nitride and molecularly adsorbed NO. At 473K, the amount of nitride increased while molecularly adsorbed NO was not observed. Neither form of nitrogen was observed at 673K. Two forms of sulfur, sulfate and sulfide, were observed at 298K on the $SO_2/Fe/SiO_2$ system. At 473K, amount of sulfide increased while the amount of sulfate decreased. Neither form of sulfur was observed at 673K. 30 references, 9 figures, 11 tables.

57449 (INIS-BR—31) Synthesis, characterization and behavior to gamma radiation of copper (II) complex and l-asparagine. Rodrigues, E.R. (Minas Gerais Univ., Belo Horizonte (Brazil). Escola de Engenharia). 1982. 72p. (In Portuguese). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83781098.

Synthesis and characterization of coordination compound formed by interation between l-asparagina (HL) and copper (II) ion are discussed. Elemental analysis, visible and ultraviolet electronic spectroscopy, infrared vibrational spectroscopy, proton nuclear magnetic resonance and melting and/or decomposition point are made; it is also possible to: a) Synthesize the complex with high degree of purity; b)determine the Λ sub(max) for absorption in the visible and ultraviolet, as well as the molar absorption coefficient; c) determine the probable structure of the complex; d) calculate the kinetic parameters and the break factor by means of radiolysis in ammoniacal aqueous solution of sample submitted by a ^{60}Co source of γ-radiation (Gamma Cell); e) separate the complex from the ionic fractions formed by radiolysis, by means of chromatography in their layers; f) determine the percentage of Cu in this complex by neutron activation; g) justify the complex resistence in solid phase to gamma radiation.

57450 (INIS-mf—8473, pp vp) Modified synroc B ceramic containing simulated high level waste. Characterization during leaching. Rossington, D.R.; Ingram, R.P.; Mayton, M.M.; Ursprung, J.S. (Alfred Univ., NY (USA). New York State College of Ceramics). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The chemical stability of Synroc-B ceramic containing simulated radioactive waste was determined by leaching experiments. Samples were characterized by leach rates ($\mu g\ cm^{-2}\ day^{-1}$) determined from atomic absorption analysis of leachant solution after exposure to the samples for various times. The stability was also examined by observation of the sample surfaces and by surface area determination of the powdered samples. Results are also expressed in terms of an accumulated eroded layer. Overall observations confirm previous reports of high stability of this form of solid radioactive waste disposal material.

57451 (INIS-mf—8473, pp vp) Iodine behaviour in containment. Lemire, R.; Paquette, J.; Torgerson, D.; Wren, D. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment:. [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Iodine behaviour is discussed for loss-of-coolant accident conditions where fuel failures might occur. Predictions are based on current understanding of iodine thermodynamics and kinetics. The predictions are being verified using a variety of experimental techniques in both the gas phase and aqueous solution phase. An abatement method based on iodine gas-phase chemistry is also being developed. Analysis and experiments to date show that the partition coefficients to (Σ[I]sub(aq)/ Σ[I]sub(gas)) should exceed 10^4 for inorganic iodine and, therefore, if equilibrium is attained, most of the iodine will be in aqueous solution.

57452 (TVA/PUB—83/46) Recent developments in producing monoammonium and diammonium phosphates using the TVA pipe-cross reactor. Salladay, D.G.; Achorn, F.P.; Greenhill, J.L. (National Fertilizer Development Center, Muscle Shoals, AL (USA)). Nov 1981. 27p. NTIS, PC A03/MF A01. Order Number DE84900080.

For several years regional NPKS granulation plants have been producing small quantities of MAP (nonammonium phosphate) with the TVA pipe-cross reactor. Now primary phosphate producers are beginning to produce MAP at rates approaching 100 tons per hour by using large pipe-cross reactors. Although much of the recent interest has been in MAP production, production of DAP (diammonium phosphide) with the PCR has continued at one location in the US. The DAP-PCR design has been refined and solutions to the scaling problems have been found. Several other primary phosphate producers are considering using a PCR to produce DAP.

57453 (KFK-tr—683) Thermal effects in sodium oxide-sodium hydrooxide-sodium systems and temperature dependence of chemical equilibrium in a hydrogen-oxygen-sodium system. Privalov, Y.V. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Stabsabteilung Internationale Beziehungen). Aug 1982. Translation of NIIAR-P—6(300), 1977, 18p. 22p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751123.

The experimental techniques are discussed and the results from the calorimetric measurements of thermal effects during the dissolution of sodium oxide in sodium and the formation of a sodium hydrooxide - sodium system are presented. Based on the data obtained some conclusions have been drawn on the forms of impurities present in sodium and the temperature dependence has been determined for the chemical equilibrium constant in a hydrogen-oxygen-sodium system.

57454 Metastable decay process $N_2Osup(+*) \rightarrow NO^+ +$ N. Maerk, T.D.; Stephan, K. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Kernphysik und Gaselektronik); Maerk, E. (Hoehere Technische Bundeslehr- und Versuchsanstalt, Innsbruck (Austria)); Kim, Y.B. (Kongju National Teachers College, Kongju (South Korea)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The collision induced and unimolecular decay of $N_2O^+ \rightarrow NO^+ + N$ is studied quantitatively. We find that the number of metastable $N_2Osup(+*)$ ions (produced by $N_2O + e \rightarrow N_2Osup(+*)$ has a lower limit of approximately 11% as compared to the stable N_2O^+ ions.

57455 Kinetic study of systems including NH^+Z ($NH^+_2 + CH_3NH_2$ and $NH^+_2 + CH_3OH$). Thomas, R.; Barassin, J.; Barassin, A. (Centre de Recherche en Physique de l'Environment, Orleans (France). Fakulte d' Orleans). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The kinetic energy dependence of the total rate constant and of the branching ratio of reaction involving NH^+_2 with CH_3OH and CH_3NH_2 have been determined in the energy range 0.05 - 1 eV by the drift tube mass spectrometer technique using 0.5 Torr of He as buffer gas. Reaction schemes are proposed for the two systems and rate coefficients are determined for each steps.

57456 Energy dependences of reactions of C^+, CH^+ and CH_2^+ with various neutrals. Niccolini, St.; Bassi, D.; Iannotta, S. (Instituto per la Ricerca Scientifica e Tecnologica, Trento (Italy)); Villinger, H.; Richter, R.; Saxer, A.; Lindinger, W. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. Atom- und Molekuelphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The energy dependences of the rate coefficients for the reactions of $CHsub(n)^+$ (n = 0,1,2) with O_2 and NO have been investigated in a drift experiment in the energy range from 0.1 to approximately 1 eV. For some of these reactions also the product distributions as a function of the relative energy between ions and reactants have been obtained.

57457 Separate reactions of the $^2Psub(3/2)$ and $^2Psub(1/2)$ ground states of Kr^+ with a number of gases from 0.04 eV to several eV. Jones, T.T.C.; Birkinshaw, K.; Jones, J.D.C.; Twiddy, N.D. (University Coll. of Wales, Aberystwyth (UK). Dept. of Physics). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The separate reactions of $^2Psub(3/2)$ and $^2Psup(1/2)$ ground states of Kr^+ with O_2, CO, N_2O and OCS have been investigated over the mean relative kinetic energy range from 0.04 eV to several eV using a Flow-Drift-Tube (FDT) apparatus. The results have been interpreted in terms of transitions between states of the reaction intermediate that correlate adiabatically to either the reactants or charge transfer products.

57458 One-electron reduction product of tris(2,2'-bipyridine)rhodium(III). Creutz, C.; Keller, A.D.; Schwarz, H.A.; Sutin, N.; Zipp, A.P. (Brookhaven National Lab., Upton, NY). pp 385-402 of Mechanistic aspects of inorganic reactions. ACS symposium series, No. 198. Rorabacher, D.B.; Endicott, J.F. (eds.). Washington, DC; American Chemical Society (1982).

The physical and chemical properties of $Rh(bpy)_3^{2+}$ generated via flash-photolytic and pulse-radiolytic methods in aqueous solutions are reported and discussed. The reduction potential (~ -0.86 V vs SHE) and electron-exchange rate ($\geqq 10^9$ M^{-1} s^{-1}) for the $Rh(bpy)_3^{3+}/Rh(bpy)_3^{2+}$ couple suggest the formulation of $Rh(bpy)_3^{2+}$ as the ligand-localized radical [Rh/sup III/ $(bpy)_2(bpy^-)]^{2+}$. By contrast, the ultraviolet-visible absorption spectrum, disproportionation chemistry, and the subsitution lability of the metal center require that $Rh(bpy)_3^{2}+$ have substantial metal-centered radical ($4d^7$ Rh(II)) character. 38 references.

57459 Non-classical diffusion of lithium in lithium borate glasses. Jain, H.; Peterson, N.L. (Argonne National Lab., IL). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* 46: No. 2, 351-355(1982).

The electrical conductivity, σ, as a function of the $^6Li/^7Li$ ratio in a series of $(^6Li/^7Li)_2O : 2.88\ B_2O_3$ glasses does not follow classical diffusion theory, in that the σ^6/σ^7 ratio is a function of temperature. The data are interpreted in terms of an absolute-reaction-rate theory incorporating quantum partition functions.

57460 Resonance absorption measurements of atom concentrations in reacting gas mixtures. IX. Measurements of O atoms in oxidation of H_2 and D_2. Pamidimukkala, K.M.; Skinner, G.B. Dayton, OH; Wright State University (1981). vp. Wright State University, Dayton, OH 45435. Contract AC02-76ER02944.

Resonance absorption spectroscopy has been used to measure oxygen atom concentrations in shock heated H_2-O_2-Ar and D_2-O_2-Ar mixtures at 1000 to 2500°K. From data on rich and stoichiometric mixtures we found ($mole^{-1}$ cm^3 s^{-1} for reaction 3 and $mole^{-2}$ cm^6 s^{-1} for reaction 5) $H + O_2 \rightarrow OH + O$; $K_3 = 1.2E14$ exp(-67.4kJ/RT); $H + O_2 + Ar \rightarrow HO_2 + Ar$; $K_5 = 4.5E14$ exp(4.2kJ/RT); $D + O_2 \rightarrow OD + O$; K/sub 3D/ = 5.8E13 exp(-62.8kJ/RT); $D + O_2 + Ar \rightarrow DO_2 + Ar$; K/sub 5D/ = 2.2E14 exp(4.2kJ/RT). The kinetic isotope effect for reaction 3 was 1.4 at 1500K, while that for reaction 5 was 2.0 in the 1000 to 1200K range. Data from very lean H_2-O_2-Ar and D_2-O_2-Ar mixtures are consistent with the rate coefficients ($mole^{-1}$ cm^3 s^{-1}). $O + H_2 \rightarrow OH + H$; $k_4 = 4.2E14$ exp(-57.5kJ/RT); $O + D_2 \rightarrow OD + D$; K/sub 4D/ = 1.9E14 exp(-59.6kJ/RT). The isotope effect for reaction 4 from the above equations is 2.6 at 1500K, compared to 1.7 from N_2O experiments.

57461 (ORNL-tr—5032) Copper redox systems in dimethylsulfoxide. Foll, A.; Le Demezet, M.; Courtot-Coupez, J. Translated from *Journal of Electroanalytical Chemistry and Interfacial Electrochemistry ;* 35: 41-54(1972). Contract W-7405-ENG-26. 19p. NTIS, PC A02/MF A01. Order Number DE83017079.

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It is concluded that the stability of dissolved copper (I) in this solvent is greatly increased by preferential solvation of cuprous cations compared to that of cupric cations. The stability range of copper (I) is again increased in the presence of complexing reagents such as chloride, bromide and thiocyanate. Formulae and stability constants of different complexes have been determined by potentiometric titration of halide solutions of cuprous and cupric cations: copper (I) forms anionic complexes of type MX_3^- as does silver (I), the molecular compounds are, however, soluble. Formation of cationic MX_3^+ or polynuclear $M_2X_3^-$ complexes could not be established, a further difference in the behavior of copper (I) and silver (I) in dimethylsulfoxide. Copper (II) forms CuX^+ and CuX_3 complexes with halides which are more stable than the corresponding ones in aqueous solution although anions are still present in minor concentrations.

4003 Organic Chemistry

REFER ALSO TO CITATION(S) 56830, 56831, 56898, 57447, 57449, 57455, 57456

57462 (LBL—16586) Phosphine- and metal hydride-induced migratory insertion in molybdenum carbonyl alkyls. Wax, M.J. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 71p. NTIS, PC A04/MF A01. Order Number DE84001243.

Thesis.

The acyl-forming reaction of $PMePh_2$ with $CpMo(CO)_3CH_3$ ($Cp = eta^5\text{-}C_5H_5$) has been examined in a series of substituted tetrahydrofurans. Kinetic studies reveal two competing pathways in tetrahydrofuran (THF). Brief investigations of reactions with PEt_3 and $P(OPh)_3$ indicate operation according to similar mechanisms, with some alteration in rate constants. The reaction of $CpMo(CO)_3R$ (1; $R = CH_3$, C_2H_5) with $CpMo(CO)_3H$ (2), which produces RCHO, $[CpMo(CO)_3]_2$, and $[CpMo(CO)_3]_2$, occurs by way of two competing pathways. No hydrogen-dueterium kinetic isotope effect is observed on either k_4 or k_5 when $CpMo(CO)_3D$ is substituted for 2.

57463 (TVA/OACD—83/16) Feasibility of incorporating the nitrogen-loss inhibitors dicyandiamide, thiouren, phenyl phosphorodiamidate, and potassium ethyl xanthate into granular urea. Gautney, J.; Kim, Y.K.; Gagen, P.M. (National Fertilizer Development Center, Muscle Shoals, AL (USA)). 1983. 28p. NTIS, PC A03/MF A01. Order Number DE84900079.

Laboratory tests were conducted to determine the feasibility of incorporating the nitrogen loss inhibitors dicyandiamide (DCD), thiourea (TU), phenyl phosphorodiamidate (PPDA), and potassium ethyl xanthate (PEX) into granular urea. Tests were made to determine the stabilities, solubilities, and dissolution rates of the inhibitors in urea melts and urea solutions; to determine the effect of inhibitor addition on the rate of weight loss and qualitative composition of volatiles evolving from urea melts; to determine the melting point diagrams for the urea inhibitor systems; and to determine the heat of fusion for the urea-inhibitor mixtures.

57464 (Y/DK—318) Method for removal of polychlorinated biphenyls in waste-hydrocarbon oils using column chromatography. Chambles, A. (Oak Ridge Y-12 Plant, TN (USA)). 30 Sep 1983. Contract W-7405-ENG-26. 20p. NTIS, PC A02/MF A01. Order Number DE84000995.

A method for adsorbing polychlorinated biphenyls (PCBs) from waste oil having an aliphatic/aromatic hydrocarbon matrix, using relatively inexpensive reclaimable adsorbents and solvents, is presented. A triplex column made of activated basic/acid/neutral alumina was found to retain greater than 98% of the PCBs when eluted with petroleum ether. Subsequent elution of the column with benzene removed the PCBs in an oil phase weighing less than 2% of the original oil weight.

57465 Generation of ultralow tensions over a wide EACN range using Pennsylvania State University surfactants. Klaus, E.E.; Arf, G.; Chung, Y.M.; Dudenas, P.; Erteken, T.; Jones, J.H.; Nagarajan, R.; Yarzumbeck, A.J. (Pennsylvania State University). *Society of Petroleum Engineers of A.I.M.E. (American Institute of Mining, Metallurgical and Petroleum Engineers), Paper;* 23: No. 1, 73-80(Feb 1983).

Saturated paraffinic and naphthenic hydrocarbons without aromatics have been vapor-phase oxidized to produce cyclic ethers and lesser amounts of olefins. These cyclic ethers appear to be effective cosurfactants for the preparation of slugs containing petroleum sulfonate surfactants. The cyclic-ether/olefin mixture has been reacted with SO_2 from oleum or liquid SO_3 to form sulfonates comprising a mixture of mono-, di-, and polysulfonates. The reaction products consisting of the sulfonates, unreacted oxidized products, and residual hydrocarbons have been extracted with isopropanol (IPA) to give two sulfonate fractions. The first fraction is predominantly monosulfonate with lesser quantities of disulfonates. The second fraction consists primarily of di-, tri-, and polysulfonates. The monosulfonate fraction in a low-concentration slug exhibits ultralow interfacial tension (IFT) against hydrocarbons of low equivalent alkane carbon number (EACN). The behavior of this fraction is similar to that of the commercial sulfonates in that its ability to generate low IFT is confined to a narrow range of EACN. To achieve low IFT's at higher EACN in the range of a Pennsylvania crude oil, it is necessary to raise the equivalent weight of the Pennsylvania State U. monosulfonate fraction by blending with a commercial sulfonate of higher equivalent weight.

57466 Quasi-crystalline organic layers studied with photo-emission and meta-emission spectroscopies. Boiziau, C.; Juret, C.; Nuvolone, R.; Reynaud, C. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Atomique); Lecayon, G. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physico-Chimie des Materiaux). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

An electropolymerized polyacrilonitrile layer (200 nm thick) is studied by M.D.S. (He (2^3S)) and UPS (HeI). We show that this layer has both insulating and conducting properties. Its electronic properties and its dielectric behaviour changes appreciably after its reticulation and with the temperature.

57467 Supersonic jet spectroscopy: some applications. ter Horst, G.H.M. Groningen, Netherlands; Rijksuniversiteit Groningen (1982). 99p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (NL).

This thesis describes experiments which indicate that supersonic jet spectroscopy is a promising tool for a detailed study of the spectroscopic and dynamic properties of optically excited large organic molecules. In Chapter 2 the author gives a detailed treatment of the expansion process as far as relevant to optical spectroscopy in supersonic jets. Especially the effects of low energy collisions are considered because Stern-Volmer type experiments, which in the hot vapor elucidate the sensitivity of the fluorescent emission to collisions, have a nice equivalent in the supersonic jet. In chapter 3 a treatment is given of the experimental set-up used for the experiments. In chapters 4-7 the results of spectroscopic studies of jet cooled para-benzoquinone and pyrazine are reported. The role of the molecular rotation on the relaxation of optically excited polyatomic molecules is also studied. Although rovibronic levels can of course be excited in the hot vapor, the observed decay is usually an average over a large number of them. Therefore, rotational effects, if any, are averaged out. The coupling matrix elements involved in the decay properties are usually described in terms of vibronic and/or spin-orbit interactions, possible rotational effects are only implicitly contained in the number of effectively coupled levels.

57468 Product profiles observed during the pyrolyses of toluene, benzene, butadiene, and acetylene. Kern, R.D.; Singh, H.J.; Esslinger, M.A.; Winkeler, P.W. (Univ. of New Orleans, Louisiana). *Symposium (International) on Combustion, [Proceedings]*; 1351-1358(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The thermal decomposition of toluene, benzene, butadiene, and acetylene have been studied by dynamic analysis of the gas from the reflected shock zone with a time-of-flight mass spectrometer. The reacting mixtures were highly dilute and their initial compositions were adjusted to yield a carbon atom shock zone density of (1.0 to 2.2) x 10^{17} atoms cm^{-3} over the temperature and total pressure range of (1400 to 2300 K) and (0.21 to 0.57) atm. Concentration profiles were constructed during typical observation times of 700 to 1000 μs. The major products detected in the pyrolyses of toluene and benzene were acetylene and polyacetylenes up to C_8H_2 which were shown to be relatively stable under these reactions conditions. There were no other products recorded with a mass greater than m/e 92 (toluene) or m/e 78 (benzene) in a detection range that extended to m/e 300. Butadiene formed benzene in relatively small amounts during the course of butadiene decay but the benzene decomposed readily to form acetylene and polyacetylenes.

Mass balances with respect to observed carbon containing compounds accounted for 70 to 100% of the total carbon atom input. It was concluded that the maximum soot yield was less than 10% for toluene which was much lower than soot yields of ~80% reported from laser extinction-shock tube experiments. Furthermore, the reaction pathways utilized mostly in the pyrolyses of aromatics are those involving ring fragmentation steps as opposed to ring condensations which occur to a much lesser extent over the temperature and pressure range investigated.

57469 **(UCRL-Trans—11909) Synthesis of dihydroxysulfidine.** Belonosov, I.S. Translated from *Zhurnal Prikladnoi Khimii (Leningrad) ;* **22**: No. 10, 1103-1107(1949). Contract W-7405-ENG-48. 12p. NTIS, PC A02/MF A01. Order Number DE84001306.

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Until recently an unusable waste product in the production of opium alkaloids was meconic acid $C_7H_4O_7.3H_2O$. When the alkaloids are extracted, meconic acid is obtained as the ammonium salt in an amount of 2 to 5% with respect to the weight of the opium. The synthesis of dihydroxysulfidine was carried out via the following steps: ammonium salt of meconic acid - meconic acid - comenic acid - comenaminic acid - ethyl ester of comenaminic acid - amide of comenamenic acid - the 2-amino-3,4-dihydroxypyridine of comenaminic acid. The latter upon condensation with acetanilidine-p-sulfonyl chloride yields p-aminobenzenesulfonamido-[$\alpha(\beta\text{-}\gamma)$dihydroxypyridine] - dihydroxysulfidine (by analogy with sulfidine).

4004 Electrochemistry

57470 **(INIS-mf—8564) Nuclear magnetic relaxation study of hydrogen exchange and water dynamics in aqueous systems.** Lankhorst, D. (Rijksuniversiteit Leiden (Netherlands)). 23 Mar 1983. 114p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781100.

Includes Dutch summary.

In this thesis exchange of water protons in solutions of some weak electrolytes and polyelectrolytes is studied. Also the dynamical behaviour of water molecules in pure water is investigated. For these purposes nuclear magnetic resonance relaxation measurements, in solutions of oxygen-17 enriched water, are interpreted. The exchange rate of the water protons is derived from the contribution of ^1H-^{17}O scalar coupling to the proton transverse relaxation rate. This rate is measured by the Carr-Purcell technique.

4005 Photochemistry

REFER ALSO TO CITATION(S) 57056, 57458

57471 **Picosecond UV-laser induced multiphoton ionization and fragmentation of benzene.** Hering, P.; Maaswinkel, A.G.M.; Kompa, K.L. (Max-Planck-Institut fuer Quantenoptik, Garching (Germany, F.R.)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

A 20 ps quadrupled Nd-YAG laser was used in this study to assure the time resolution needed to dinstinguish the various steps in the sequence of ionization and fragmentation events in the multistep photoionization of benzene. As opposed to previous MPI laser studies fragmentation was found to be essentially complete on the C_6/C_4 level. However, multiple pulses with the same total energy as a single pulse reproduced earlier results of fragmentation up to the C^+ level.

57472 **New series of photochemical reactions in flavonoid synthesis.** Van der Westhuizen, J.H. Bloemfontein, South Africa; University of the Orange Free State, Dept. of Chemistry (1979). 300p. (In Afrikaans). Available from the Registrar, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300.

The thesis consists of a study that has been made of the synthetic potential of flavonoid photochemistry. Photochemical reactions create the possibility of the refraction of coupling which can not be accomplished through the use of conventional methods. This may lead to new possibilities for synthesis. As part of the study, hydrogen 1 and carbon 13 was used to distinguish the isomeric homoisoflavenoid from the isochromanone.

4006 Radiation Chemistry

REFER ALSO TO CITATION(S) 57449, 57458

57473 **(DOE/EV/02386—22) Interaction of radiation with matter. Progress research report, January 1, 1983-December 31, 1983.** Pope, M. (New York Univ., NY (USA). Dept. of Physics; New York Univ., NY (USA). Radiation and Solid State Lab.). Oct 1983. Contract AC02-76EV02386. 78p. NTIS, PC A05/MF A01. Order Number DE84001295.

Portions are illegible in microfiche products.

This project is concerned with the electronic properties and reaction pathways of polycyclic aromatic hydrocarbons (PAH), and particulates thereof, which are of environmental concern and which are byproducts of the combustion of fossil fuels. The interaction of radiation with PAH molecules, or solid PAH systems, is the basis of a series of closely related experimental and theroretical approaches which are being utilized in this work. These related research problems include the following subjects: (1) mechanisms of energy transport in PAH crystals, particularly the migration of triplet excitons studied by optical detection of magnetic resonance techniques; (2) mechanisms of emission of photoelectrons from micron-sized PAH particles, demonstrating exoemission by energy transport; (3) electrochemical reactions of anthracene radical cations with aqueous ammonia solutions; (4) exciton-exciton interactions and annihilations in PAH systems subjected to high intensity laser radiation; (5) computer modeling calculations of particle coagulation and scavenging and, finally (7) the reaction mechanisms of PAH model metabolite compounds with nucleic acids, utilizing spectroscopic techniques to study reaction pathways and the structure of the DNA adducts. 52 references, 21 figures.

57474 **Decay of geminate ions in hexanes.** Jonah, C.D. (Argonne National Lab., IL (USA)). *Radiation Physics and Chemistry;* **21**: No. 1-2, 53-56(1983). (CONF-820286—). Contract W-31-109-ENG-38.

From International symposium on the fast processes in radiation chemistry; Tokyo, Japan (8 Feb 1982).

A direct measurement of the geminate decay process between the electron and the positive ion in n-hexane and cyclohexane is presented. For n-hexane, the decay is that which has been predicted for geminate ion decay processes in which the distribution function for the distance between positive and negative ions is exponential. For cyclohexane, the decay is well described by an exponential process with a decay time of 0.58 ns.

57475 **Investigation of radiation induced hydrogen radicals in monocrystals from uracil, adenine, hypoxanthine and guanine by electron spin resonance spectroscopy.** Zehner, H. Regensburg, Germany, F.R.; Regensburg University, Naturwissenschaftliche Fakultaet 3 - Biologie und Vorklinische Medizin (1978). 151p. (In German). Available from the library of Regensburg Univ. (Germany, F.R.).

Radiation-induced hydrogen radicals in monocrystals of various nucleic acid building blocks with uracil, adenine, hypoxanthine and guanine bases were studied by means of electron spin resonance spectroscopy. Studies of a total of eleven monocrystals with adenine bases in neutral, N1 protonated, and N1 and N7 protonated form revealed that hydrogen radicals occur as frequently at the C_8-carbon as at the C_6 position. This was clearly confirmed by the study of C_8 deuterated crystals.

4007 Radiochemistry And Nuclear Chemistry

REFER ALSO TO CITATION(S) 57372

57476 **(DOE/EV/10363—5) Study on the utility and versatility of organoborane. Progress report, March 1, 1983-February 28, 1984.** Kabalka, G.W. (Tennessee Univ., Knoxville (USA). Dept. of Chemistry). 1983. Contract AS05-80EV10363. 7p. NTIS, PC A02/MF A01. Order Number DE84000834.

Purpose was to develop rapid methods for introducing short-lived radionuclides into agents for use in diagnostic nuclear medicine. Methods were developed for iodination, amination, bromination, and oxygen-17 incorporation. (DLC)

57477 **(LBL—16040) Some reminiscences of the early days of californium.** Ghiorso, A. (Lawrence Berkeley Lab., CA (USA)). May 1983. Contract AC03-76SF00098. 9p. (CONF-8305108—2). NTIS, PC A02/MF A01. Order Number DE84001097.

From Symposium on particle induced mass spectroscopy of involatile molecules; College Station, TX, USA (16 May 1983).

The discovery of ^{253}Cf production in the Mike explosion is reviewed. (DLC)

57478 **Radioiodination of 15-(p-iodophenyl)-6-tellurapentadecanoic acid by triazene decomposition with radioiodide.** Knapp, F.F. Jr.; Goodman, M.M.; Callahan, A.P. (Oak Ridge National Lab., TN (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1323-1325(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

Radioidinated tellurium fatty acids are important in diagnosing heart disease because of the 'trapping' phenomenon in the myocardium. A synthetic method for preparing radioiodinated para-iodophenyl tellurium fatty acids is developed, involving the decomposition of the aryltriazene intermediate. Na ^{123}I and Na ^{125}I were used for radioiodination. Tissue distribution studies were carried out on rats, and pronounced myocardial uptake resulted.

57479 **Synthesis of 5'[deoxy-5--^{18}F]fluorouridine as a probe for measuring tissue proliferation in vivo.** Shiue, C.Y.; Wolf, A.P.; Friedkin, M. (Brookhaven National Lab., Upton, NY (USA)). *Journal of Labelled Compounds and Radiopharmaceuticals;* **19**: No. 11-12, 1395-1397(Nov-Dec 1982). (CONF-8208101—).

From 4. international symposium on radiopharmaceutical chemistry; Juelich, F.R. Germany (23 Aug 1982).

A new fluorinated nucleoside 5'-deoxy-5-fluoridine has been synthesised, in high radiochemical yield, from either $^{18}F_2$ or $CH_3COO^{18}F$. It has been used to measure the differences in biodistribution in normal and tumour bearing mice.

57480 **Membrane phosphorylation and nerve cell function.** Baer, P.R. Utrecht, Netherlands; Rijksuniversiteit Utrecht (1982). 142p. Available from Library, KNAW, Kloveniersburgwal 29, 1011 JV Amsterdam (NL).

This thesis deals with the phosphorylation of membrane components. In part I a series of experiments is described using the hippocampal slice as a model system. In part II a different model system - cultured hybrid cells - is used to study protein and lipid phosphorylation, influenced by incubation with neuropeptides. In part III in vivo and in vitro studies are combined to study protein phosphorylation after neuroanatomical lesions. In a section of part II (Page 81-90) labelling experiments of the membrane inositol-phospholipids are described. ^{32}P-ATP was used to label phospholipids in intact hybrid cells, and short incubations were found to be the most favourable.

4008 Combustion, Pyrolysis, And High-temperature Chemistry

57481 **(DOE/ER/10964—T1) PDF: a computer program for calculation of turbulent combustion utilizing a probability density function (PDF) approach.** Wormeck, J.J. (Dynamics Technology, Inc., Torrance, CA (USA)). Sep 1983. Contract AC03-81ER10964. 119p. (DT—8152-03). NTIS, PC A06/MF A01. Order Number DE84000999.

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This report contains a detailed description and user's guide for a collection of FORTRAN-77 subroutine subprograms which enable the extension of any existing hydrodynamic computer code to the calculation of multi-dimensional, laminar or turbulent flows with chemically complex equilibrium stationary states. The version of PDF described is limited to adiabatic, homogeneous, ideal gas-phase chemical equilibrium. An example calculation is given for a parabolic flow for mixing and combustion of initially unmixed methane and air in a simple shear flow.

57482 **(DOE/ER/10964—T3) CI: a computer program for calculation of contact indexes which will correct reaction rates evaluated by mean quantities during simulations of turbulent combustion.** Wormeck, J.J. (Dynamics Technology, Inc., Torrance, CA (USA)). Sep 1983. Contract AC03-81ER10964. 120p. (DT—8152-04). NTIS, PC A06/MF A01. Order Number DE84001000.

This report contains a detailed description and user's guide for a collection of FORTRAN-77 subroutine subprograms which compute the contact indexes for a general reaction mechanism. Such indexes will correct the mean formation rate of species when evaluated in terms of time-mean values of temperature and concentrations. Example calculations are presented for elliptic and parabolic reacting flows which consider both mixing-limited and kinetically-limited combustion.

57483 **(DOE/ER/13045—1) Comprehensive mechanisms for combustion chemistry of alcohols: an experimental and numerical study with emphasis on applied sensitivity analysis. Progress report, 15 January 1983-15 September 1983.** Dryer, F.L. (Princeton Univ., NJ (USA). School of Engineering and Applied Science). 1983. Contract AC02-83ER13045. 8p. NTIS, PC A02/MF A01. Order Number DE84001567.

An extensive review of chemical kinetic modelling of hydrocarbon combustion chemistry and applications has been completed. Numerous use of elementary sensitivity analysis in the development and study of elementary chemical kinetic mechanisms have been demonstrated using the mechanisms for moist $CO/H_2/O_2$ chemistry at combustion temperatures. Kinetic modelling and sensitivity analysis codes have been installed and excerised at Brookhaven, and collaboration with local personnel on the use of these aids in their elementary kinetics studies has been initiated. Ethanol pyrolysis and oxidation data have been collected and modelling work, particularly on acetaldehyde combustion chemistry has been initiated. The various parts of this work which are continuing are also outlined.

57484 **Nineteenth symposium (international) on combustion.** Pittsburgh, PA; Combustion Institute (1982). 1530p. (CONF-820801—). Combustion Institute, 200 South Craig St., Pittsburgh, PA 15213. Contract FG22-82PC50259.

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A total of 161 papers are arranged in sections entitled: elementary reactions, reaction mechanisms and modeling, laminar flames, flame chemistry, turbulent reacting shear flows, turbulent premixed flames, turbulent combustion measurements, continuous combustors, detonation, detonation and explosion, heterogeneous detonation, propellant combustion, fire-ignition and thermal degradation, fire-flame spread and burning, fire-modeling, spray combustion, droplet combustion, coal combustion kinetics and mechanisms, coal combustion mechanisms and pyrolysis, coal combustion techniques, NO/sub x/ in coal combustion, gaseous pollutants, soot and PAH, soot and inorganic pollutants, IC engine combustion, and ignition and extinction. Abstracts were prepared for 39 of the papers.

Seventeen of the remaining papers have been previously abstracted. (DLC)

57485 **Study of the reaction of O(³P) with ethylene.** Nicovich, J.M.; Ravishankara, A.R. (Georgia Inst. of Tech., Atlanta, GA). *Symposium (International) on Combustion,* [*Proceedings*]; 23-30(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Absolute rate coefficients for the reaction of O(³P) with C_2H_4(k_1) and C_2D_4(k_2) were measured over the temperature range of 298 to 940 K, using the technique of flash photolysis-resonance fluorescence. The measured bimolecular rate coefficients increase monotonically with temperature. $k_1(T)$ is seen to exhibit a recognizable curvature in its Arrhenius plot. At 800 K, H atoms were detected as being a product of reaction (1). Kinetics and mechanistic information derived from these measurements are discussed.

57486 **Laser pyrolysis/laser fluorescence technique for combustion chemical kinetics.** Fairchild, P.W.; Smith, G.P.; Crosley, D.R. (SRI International, Menlo Park, CA). *Symposium (International) on Combustion,* [*Proceedings*]; 107-115(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A new two-laser method for the real-time measurement of radical/molecule reaction rates at temperatures of 800 to 1400 K is described. A mixture of SF_6, N_2, H_2O_2, and H_2O at 40 torr is irradiated by a pulsed infrared CO_2 laser (1J/cm²). Absorption by the SF_6 and subsequent thermalizing collisions heat the mixture, and some of the H_2O_2 decomposes to OH. A pulsed dye laser, fired after a variable time delay, produces a laser-induced fluorescence signal in OH, which is used to determine its density and rotational temperature. After expansion wave cooling, the heated region reaches a temperature, relatively uniform in both position and time, during which period bimolecular reaction rates can be measured. As an example, a rate constant of $1.3 \pm 0.4 \times 10^{-12}$ cm^{3}s^{-1} for OH + CH_4 at 1030 K +- 50 K was measured. Details of the heating dynamics and considerations important for kinetics measurements are discussed.

57487 **C_1 and C_2 chemistry in rich mixture, ethylene/air flames.** Levy, J.M.; Taylor, B.R.; Longwell, J.P.; Sarofim, A.F. (Massachusetts Inst. of Tech., Cambridge, MA). *Symposium (International) on Combustion,* [*Proceedings*]; 167-179(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Decay profiles of methane, acetylene, and hydrogen atoms are modeled in the post flame zone of four fuel-rich, atmospheric pressure ethylene/air flat flames, at fuel equivalence ratios of 1.71 to 1.83 and adiabatic flame temperatures of 1992 to 2126 K. Chain branching is required in the fuel-rich hydrocarbon combustion mechanism for the simulation of hydrogen atom measurements. The mechanism of hydrocarbon suppression of free radical overshoot is discussed.

57488 **Numerical analysis of the early phase development of spark-ignited flames in CH_4-air mixture.** Sher, E.; Refael, S. (Ben-Gurion Univ. of the Negev, Beer Sheva, Israel). *Symposium (International) on Combustion,* [*Proceedings*]; 251-257(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The mechanism of igniting a combustible mixture of methane-air by means of an electrical spark is theoretically studied. The spark discharge was simulated by a cylindrical pocket of a combustible mixture having initially ambient conditions and a constant volumetric heat source. The oxidation of methane was assumed to proceed through an eighteen reaction step scheme. The analysis was performed by solving numerically the relevant conservation equations in the radial direction of a cylindral coordinate system, and the evolution of the species concentrations, with time, as well as the temperature and burning velocity were predicted.

57489 **Measurement of temperature distributions in a methane-air flame by moire deflectometry.** Bar-Ziv, E.; Sgulim, S.; Kafri, O.; Keren, E. (Nuclear Research Center-Negev, Beer-Sheva, Israel). *Symposium (International) on Combustion,* [*Proceedings*]; 303-310(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The temperature mapping of an axially symmetric premixed methane-air flame was determined by moire deflectometry. From the analysis of the moire data detailed information on the temperature distribution is obtained. The radial profile of the temperature shows a minimum at the center of the flame which gradually disappears when proceeding downstream, as expected. The main advantage of moire deflectometry over other techniques is that the temperature distribution of the entire flame is obtained with no need for a three dimensional scanning. We have shown that the technique provides valuable and detailed information which could lead to a better understanding of combustion mechanisms. The limitations of the method are discussed.

57490 **Structure of buoyant methane and propane diffusion flames.** Jeng, S.M.; Chen, L.D.; Faeth, G.M. (Pennsylvania State Univ., University Park). *Symposium (International) on Combustion,* [*Proceedings*]; 349-358(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

New measurements of the structure of turbulent, axisymmetric methane diffusion flames, with significant buoyancy effects, are reported-which include careful characterization of initial conditions and total radiative heat losses. These measurements, as well as existing measurements for propane flames, are used to evaluate k-ε-g models of the process, considering several past proposals for treating effects of buoyancy on turbulence properties. Reasonably good agreement was obtained between predictions and measurements, using model constants established in the literature, for initial Reynolds numbers greater than 2900. It was found that including effects of buoyancy on turbulence properties had a relatively minor effect on mean flame structure; however, adequate specification of initial conditions is shown to be particularly important for buoyancy dominated flames having a low initial momentum.

57491 **Lean premixture combustion on a coaxial burner.** Negishi, N. (Tokyo Metropolitan College of Aeronautical Engineering, Japan). *Symposium (International) on Combustion,* [*Proceedings*]; 441-447(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The interaction between inner and external coaxial flames is experimentally investigated in detail. The minimum equivalence ratio, phi/sub t/, of CH_4-air premixtures (test premixtures) for complete combustion is measured as a function of the flow rate by the use of a small pilot flame whose equivalence ratio, phi/sub p/ is equal to unity or less. The minimum phi/sub t/, is dependent upon phi/sub p/ and the flow rate of the test premixture. The effects of radial and axial separations of the two flames are also investigated with the use of three types of burner ports. The existence of diffusive and convective mixing of the two flows on a coaxial burner is proved. The magnitude of the mixing is estimated by a numerical calculation. A small amount of mixing plays an important role in stabilizing the flame in a highspeed flow of the lean premixture. It is concluded that the use of a coaxial burner for the measurements of the flammability limits is invalid. This paper also discusses the merit of simple coaxial burners without any thermal feedback or recirculating flow for lean premixture combustions. The overall minimum equivalence ratio attained by the present experiments is 0.6 at a mean flow velocity of 5.3 m/s.

57492 **Two-point Rayleigh scattering measurements in a V-shaped turbulent flame.** Namazian, M.; Talbot, L.; Robben, F.; Cheng, R.K. (Univ. of California, Berkeley). *Symposium (International) on Combustion,* [*Proceedings*]; 487-493(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A Rayleigh scattering technique for simultaneous measurement of density at two points in a flame was developed. This technique was used to deduce the spatial and time-space correlation and the two-point joint probability density function of the density in a premixed turbulent flame in three orthogonal directions. A grid generated turbulent V-shaped flame at a flow velovity of 7.0 m/s and a half angle of 12° was used. The analysis shows that this flame consists of structures of equal length scale in all three directions which decay as they are convected downstream by the flow. It is also shown that this flame does not consist of flamelets.

57493 **Internal group combustion of liquid droplets.** Chiu, H.H.; Kim, H.Y.; Croke, E.J. (Univ. of Illinois, Chicago). *Symposium (International) on Combustion, [Proceedings]*: 971-980(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

A quasi-steady internal group combustion model of a spherical droplet cloud has been developed to assess the effects of the collective behavior of fuel droplets on combustion characteristics and cloud structures. Analytical solutions are obtained for the predictions of the distributions of the temperature, concentrations of fuel vapor, and oxidizer in strongly and weakly interacting zones. Overall burning rate under internal group combustion mode at various flame penetration is also obtained. Numerical analysis is carried out to determine the combustion behavior of droplet clouds at some selected group combustion numbers. It was found that for a cloud of n-butylbenzene droplets, the group envelope flame is stabilized on the boundary of the droplet cloud for a group combustion number of 1.36. As the group combustion number decreases, the envelope flame penetrates into the droplet cloud and divides the cloud into two zones; a strongly interacting zone located inside the group envelope flame and a weakly interacting zone established between the envelope flame and the boundary of the cloud. In the strongly interacting zone, the droplet vaporizes and the vapor produced is consumed at the group envelope flame. The droplets in a weakly interacting zone burn with an envelope flame surrounding each droplet. When the group combustion number decreases to 0.1, the group envelope flame degenerates into a point flame at the center of the droplet cloud.

57494 **Analytical solution for diffusion and circulation in a vaporizing droplet.** Tong, A.Y.; Sirignano, W.A. (Carnegie-Mellon Univ., Pittsburgh, PA). *Symposium (International) on Combustion, [Proceedings]*: 1007-1020(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

The problem of convective diffusion in a liquid droplet with internal circulation is studied. Both the vaporizing and the nonvaporizing cases are considered. An approach which simplifies the governing equations is taken and series solution for both the temperature boundary condition and temperature gradient boundary condition cases are obtained. The results are in reasonably close agreement with the finite-difference solution of the more exact analysis. In the nonvaporizing droplet case, the coupled gas-phase and liquid-phase problem is examined. Solution for the droplet surface temperature in the form of a linear Volterra Integral Equation, utilizing the series solution, is obtained. The results are very promising for future simplifications in spray combustion analyses.

57495 **Mixed-convective flame structure in the stagnation point of a fuel particle.** Fernandez-Pello, A.C.; Law, C.K. (Univ. of California, Berkeley). *Symposium (International) on Combustion, [Proceedings]*: 1037-1044(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

An analysis is developed for the mixed, forced and free, convective gasification, ignition, steady burning and extinction at the stagnation point of a condensed fuel particle. The analysis makes use of the boundary layer approximation to describe the gas flow, of the flame-sheet approximation to analyze the fuel burning process, and of large activation energy asymptotics to study the ignition and extinction phenomena. A mixed-convection parameter is introduced in the formulation of the problem in such a way that the forced or free conditions are respectively recovered for zero value of the Grashof or Reynolds number. This unified formulation of the problem permits the derivation of general criteria for ignition and extinction, and the description of the gasification and burning processes when the fuel particle is subjected to convective flows of different nature and intensity. Explicit expressions are derived for the gasification and mass burning rates and for the critical Damkoehler numbers for ignition and extinction.

42 ENGINEERING

4201 General Engineering

57496 **(INIS-mf—8537) Proceedings of the 3. Austrian - Italian - Yugoslav chemical engineering conference. 276. Event of the European Federation of Chemical Engineering. Volume 1.** (Rome Univ. (Italy)). 1982. 569p. (CONF-8209154—Vol.1). NTIS (US Sales Only), PC A24/MF A01. Order Number DE84780008.

From 3. Austrian-Italian-Yugoslav chemical engineering conference and 276. meeting of the European Federation of Chemical Engineering; Graz, Austria (14 Sep 1982).

Abstracts for each paper were entered into the data base. (MOW)

57497 **(MLM—3105(OP)) Component temperature versus laser-welding parameters.** Jones, W.H. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 1983. Contract AC04-76DP00053. 6p. (CONF-8309158—1). NTIS, PC A02/MF A01. Order Number DE84000362.

From 3. international colloquium on welding and melting by electrons and laser beams; Lyon, France (5 Sep 1983).

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Applications have arisen in which the component temperature near a laser weld is critical because of possible damage to the explosive powder adjacent to the member being welded. To evaluate the thermal excursion experienced at the powder cavity wall, a study was conducted using assemblies that had been equipped with 0.05 mm diameter thermocouple wires. The main goal of the study was to determine how changes in the laser welding parameters owuld affect the powder cavity wall temperature. The objective lens-to-work distance, pulse rate, and beam power parameters were varied. The peak temperature varied from 117°C to 311°C in response to welding parameter changes. The study concluded that by utilizing a selected set of welding parameters, the design requirement of a 160°C maximum powder cavity wall temperature could easily be satisfied.

57498 **(SAND—83-1120C) Thermal modeling of laser welding with a quasi-one-dimensional approach.** Blottner, F.G. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 13p. (CONF-8307101—1). NTIS, PC A02/MF A01. Order Number DE84001292.

From Modeling of casting and welding processes conference; Henniker, NH, USA (31 Jul 1983).

A relatively simple numerical technique for predicting the melt depth is developed for pulsed laser welding. The two-dimensional aspects of the solution are approximated with an effective area in the one-dimensional energy equation. The enthalpy method is used with an implicit numerical scheme which provides a rapid solution procedure. A preliminary model of metal absorptivity of the laser radiation is developed but requires some experimental input. For an assumed absorptive model, predictions and measurements are in reasonable agreement for different laser operating conditions.

4202 Facilities And Equipment

REFER ALSO TO CITATION(S) 56857, 56860, 56867, 56868, 56946, 57027, 57028, 57345, 57553, 57554

57499 (DESY—83-020) Performance of 1 m long / 75 mm bore superconducting prototype coils for HERA. Schmueser, P.; Wiik, B.H.; Horlitz, G.; Kaiser, H.; Knust, G.; Mess, K.H.; Wolff, S. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 3p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751117.

Two short prototypes of the new HERA superconducting dipole magnets with 75 mm inner bore have been built and tested in a bath cryostat. Both coils have reached the short sample current of the coil after a few training steps. The quench current depends linearly on the temperature between 4.0 and 5.0 K. The field quality of both coils is in general within specifications. There is no current dependence of the higher harmonics except for the well-known hysteresis due to persistent currents.

57500 (INIS-BR—35) Fabrication techniques of metal liner used for pressure vessels made by composite material. Takahashi, W.K.; Al-Qureshi, H.A. (Centro Tecnico Aeroespacial, Sao Jose dos Campos (Brazil). Inst. Tecnologico de Aeronautica). 1982. 8p. (In Portuguese). (CONF-821248—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781108.

From 5. Brazilian congress on materials science and engineering; Porto Alegre, Brazil (13 Dec 1982).

Different viable techniques for the manufacturing of metal liner used for pressure vessels are presented. The aim of these metal liner is to avoid the fluid leakage from the pressurized vessel and to serve as a mandreal to be wound by composite material. The studied techniques are described and the practical results are illustrated. Finally a comparative study of the manufacturing techniques is made in order to define the process that furnishes the metal liner with the best characteristics. The advantages offered by these type of pressure vessels when compared with the conventional metallic vessels, are also presented.

57501 (KEK—80-15) Proceedings of the 3rd symposium of machine work of scientific instruments, KEK, October 24, 1980. Hongo, T. (ed.). (National Lab. for High Energy Physics, Oho, Ibaraki (Japan)). Feb 1981. 42p. (CONF-8010331—). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83781083.

From 3. symposium on machine work of scientific instruments; Oho, Japan (24 Oct 1980).

Abstracts of individual items from the symposium were prepared separately for the data base. (GHT)

57502 (KY—735) Thermal analysis of Model 48-14 UF_6 cylinder overpack using the HEATING5 computer code. Burnett, W.A. (Paducah Gaseous Diffusion Plant, KY (USA)). Sep 1983. Contract W-7405-ENG-26. 27p. NTIS, PC A03/MF A01. Order Number DE84001584.

The Model 48-14 protective overpack designed and fabricated by Nuclear Containers, Incorporated of Elizabethton, Tennessee, in a joint development with the US Department of Energy, is being considered for potential use in the shipment of UF_6 cylinders containing material enriched up to 4.5 wt % in $^{235}UF_6$. In order to partially satisfy licensing requirements, it must be satisfactorily demonstrated that the overpack and its contents can withstand thermal exposures specified for both normal transportation and accident conditions. Normal transportation conditions consist of exposures to -40°F ambient temperature in shade and to 130°F ambient temperature in direct sunlight. Accident conditions consist of a thirty-minute exposure to a 1475°F heat source followed by a three-hour cooldown period in still, 130°F ambient air in direct sunlight. Computer simulations using the HEATING5 heat conduction code were performed to determine the thermal response of the overpack and UF_6 cylinder to these exposures. Based on results of these analyses and engineering judgement, the overpack is expected to provide adequate protection in the transportation environment.

57503 (LCC—007/82) Plastic collapse of tubes submitted to a ring load by optimization. Zouain, N.; Taroco, E.; Feijoo, R.A. (Laboratorio de Computacao Cientifica, Rio de Janeiro (Brazil)). May 1982. 24p. (In Spanish). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703725.

The limit analysis of a tube with finite length, made of a rigid - plastic material, is considered for the case of an internal load uniformely distributed in a cross section of the tube. The exact creep law is calculated for several qualitatively differents cases, namely different tube lengths. The corresponding stress and collapse mechanisms are given so that they can be compared to the approximations developed here. The static and kinematic theorems on plastic collapse are used for establishing two numerical methods of resolution, specifically mathematical programming and finite element method. These mathematical methods are applied to collapse load for the considered tube.

57504 (N—8323011) Pump-turbine boundary conditions modelling for pumped storage scheme control policy simulation. Brauer, A.M.W. (Electricity Supply Commission, Johannesburg (South Africa)). 1982. 5p. NTIS, PC A13/MF A01.

In NRIMS Symp. on Control Theory and Appl. 5 p (SEE N83-23007 12-59).

The indirect method of pump-turbine boundary conditions modelling is presented. This method makes use of pump-turbine model's steady-state data in order to evaluate machine characteristics' partials. Practical application of the method in non-linear simulation of the Drakensberg Pumped Storage Scheme's open loop dynamic behavior study is described. Usefulness of the method for closed loop control policy investigations is touched upon.

57505 (SAND—82-2018C) Development of a large fire test facility for packaging thermal testing. Yoshimura, H.R.; Gill, W.; Allen, G.C.; Uncapher, W.L.; Moya, J.; Cline, D.D.; Eakes, R.G.; Davis, J.O. (Sandia National Labs., Albuquerque, NM (USA)). 1982. Contract AC04-76DP00789. 10p. (CONF-830528—60). NTIS, PC A02/MF A01. Order Number DE84001285.

From 7. international symposium on packaging and transportation of radioactive materials; New Orleans, LA, USA (15 May 1983).

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This paper addresses the progress on the development of a wind-shielded Large Fire Test Facility. Although the facility is still in development, the following work has been accomplished. (1) a conceptual design for the full-scale facility has been completed; (2) an analytical model for both open and enclosed fires is under development; (3) a versatile facility for experimental evaluation of scaling laws and analytical model development has been constructed and is in full operation; and (4) details of the mechanical design have been completed and are ready for implementation when the final configuration is determined. 5 references, 8 figures.

57506 Optimization of bit hydraulic configurations. Glowka, D. (Sandia Natl. Laboratories). *Society of Petroleum Engineers of A.I.M.E. (American Institute of Mining, Metallurgical and Petroleum Engineers), Paper;* **23**: No. 1, 21-32(Feb 1983). Contract AC04-76DP00789.

Measurements of flow field characteristics across the face of a stud-mounted PDC bit have been obtained in a new test facility which simulates downhole flow fields. This facility and the measurement techniques employed to obtain the data are described. Flow tracer tracking and cutter heat transfer coefficient measurements are shown to be valuable in determining flow field characteristics, whereas the utility of the dye injection system tested is low. Three hydraulic configurations for the bit have been tested to determine the effects of nozzle location on bottomhole crossflow velocities and cutter cooling rates. The configuration that provides higher velocities and cooling rates is determined to be the one that employs smaller nozzles located near the center of the bit.

4203 Lasers

REFER ALSO TO CITATION(S) 57051, 57813, 57921, 57990

57507 (DOE/DP/40173—1) Study of $O_2(^1\Delta)$ production by nuclear pumping. Final report, 12 April 1982-30 June 1983. Miley, G.H. (Illinois Univ., Urbana (USA)). 1 Jun 1983. Contract AS08-82DP40173. 98p. NTIS, PC A05/MF A01. Order Number DE84001374.

Studies concerned with the possible use of nuclear pumping to produce $O_2(^1\Delta)$ are described. The goal is to develop methods to produce adequate $O_2(^1\Delta)$ to use in an O_2-I_2 mixing-type laser. Although the $O_2(^1\Delta)$ concentrations generated in the nuclear induced discharge are too small for the operation of an iodine laser, one of the most promising approaches identified involves the initial production of ozone by nuclear pumping of a high pressure ($\sim$ 5 atm) O_2-He mixture. The ozone mixture is then photodecomposed by use of a KrF nuclear pumped flashlamp. Based on a combination of experimental and theoretical data, it is estimated that $O_2(^1\Delta)/O_2$ ratios $>$ 0.3 can be produced this way with $\sim$ 7 Torr of $O_2(^1\Delta)$ in a mixture initially containing 2 Torr of O_2. This is well above the minimum requirements for operation of an iodine laser. Experimental results of nuclear pumping O_2-noble gas mixtures in a pulsed TRIGA reactor are described and scaling relations developed.

57508 (UCRL—89867) Simulation of a high-gain tapered-wiggler free-electron laser. Fawley, W.M.; Scharlemann, E.T.; Prosnitz, D. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1983. Contract W-7405-ENG-48. 6p. (CONF-830911—25). NTIS, PC A02/MF A01. Order Number DE84001237.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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We present results from a numerical model of a high-gain (electron-beam power $>$ input laser beam power) FEL amplifier.

4204 Heat Transfer And Fluid Flow

REFER ALSO TO CITATION(S) 57851, 57852

57509 (ANL—83-74) Computations of turbulent recirculating flows with fully coupled solution of momentum and continuity equations. Vanka, S.P. (Argonne National Lab., IL (USA)). Aug 1983. Contract W-31-109-ENG-38. 68p. NTIS, PC A04/MF A01. Order Number DE84001529.

A fully coupled solution algorithm for pressure-linked fluid flow equations earlier found to be rapidly convergent in laminar flows has been extended to calculate turbulent flows. The governing mean flow equations are solved in conjunction with a two-equation (k - ϵ) turbulence model. A number of two-dimensional recirculating flows have been computed and it is shown that the calculation procedure is rapidly convergent in all the cases. The calculations have been compared with published experimental data; their agreement is in accord with other published experiences with the (k - ϵ) model in similar flows.

57510 (DP-MS—83-5) Calculation of natural convection within a heated enclosure using the method of second moments. Pepper, D.W. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 15p. (CONF-831111—2). NTIS, PC A02/MF A01. Order Number DE84001596.

From ASME winter annual meeting; Boston, MA, USA (13 Nov 1983).

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The method of second moments is a quasi-Lagrangian, explicit numerical method which calculates the advection of a variable without numerical dispersion, damping, or phase error. The technique is particularly attractive for calculating temperatures and other scalar transport equations, and has been used primarily for environmental modeling. Application of the technique to free convection studies indicates that the method can also be adapted to calculate the transport of vorticity for low to moderate Rayleigh numbers. In fact, transport equations of the form similar to the vorticity equation can be solved with the technique, providing the equation can be quasi-linearized. Use of the technique for calculating highly nonlinear equations (e.g., shock fronts) can become troublesome. Instability can result in nonlinear self advection problems as a result of high wave number amplification and nonconservation of the integral relations. Since the technique maintains subgrids may be utilized near steep gradients. Low CFL limits are required to prescribe the velocity field for Rayleigh numbers $>10^4$.

57511 (ILR—54) Hybrid computation method for determining fluctuations of temperature in branched structures. Czomber, L. (Technische Univ. Berlin (Germany, F.R.). Inst. fuer Luft- und Raumfahrt). 1982. 142p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751282.

A hybrid computation method for determining temperature fluctuations at discrete points of slab like geometries is developed on the basis of a new formulation of the finite difference method. For this purpose, a new finite difference method is combined with an exact solution of the heat equation within the range of values of the Laplace transformation. Whereas the exact solution can be applied to arbitraryly large ranges, the finite difference formulation is given for structural ranges which need finer discretization. The boundary conditions of the exact solution are substituted by finite difference terms for the boundary residual flow or an internal heat source, depending on the problem. The resulting system of conditional equations contains only the node parameters of the finite difference method.

57512 Derivation of vertically averaged equations describing multiphase flow in porous media. Gray, W.G. (Princeton University, NJ). *Water Resources Research;* **18**: No. 6, 1705-1712(Dec 1982). Contract AC03-80SF11489.

An extension of the REV averaging technique, used to derive balance equations for multiphase or porous media flow problems, is presented. Theorems which allow a one-step transformation from three-dimensional point equations for a single phase to two-dimensional point equations for multiphase systems are derived. The theorems are then applied to obtain the vertically averaged balance equations of mass, chemical species, momentum, energy and entropy. The relation between these equations and their unaveraged predecessors is clearer than when the standard two-step averaging procedure is applied. Furthermore, constitutive relations are more easily hypothesized for the current system of equations than for previously derived forms.

4205 Materials Testing

REFER ALSO TO CITATION(S) 57291, 57591

57513 (FhG-W—6/82) Studies of crack behaviour under superimposed normal and shear loads. Kordisch, H. (Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.V., Freiburg im Breisgau (Germany, F.R.). Inst. fuer Werkstoffmechanik). Jul 1982. 114p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751146.

With 83 figs., 5 tabs., 99 refs.

In this paper the methods and the reliability is discussed for the prediction of cracks under superimposed normal and shear loads within the limits of linear elasticity. Based on fracture mechanical formulations of the stresses in the crack tip region, already well-known and newly derived crack models are presented together with a comparison of their predictions with respect to crack deviation angles and critical stresses. In part significant deviations are obtained for the different models with increasing shear stresses. On this basis an attempt is made to critically analyse the physical background of the crack models, using numerical and experimental methods, in order to indicate the limits of the different models.

57514 **(Juel—1807) Interference layer metallography.** Schmidt, K.; Hoven, H.; Koizlik, K.; Linke, J.; Nickel, H. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorwerkstoffe und Heisse Zellen). Sep 1982. 72p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751121.

Refractory metallic materials for application in Gas Cooled High Temperature Reactors are age-hardened nickel or iron base alloys. To control their behaviour and to adapt it to realistic load conditions, these materials have to be subjected to suitable informing tests and characterized. In the past few years, interference layer metallography has proved to be a highly flexible characterization procedure, suitable as an independent investigation method as well as an outstanding way of sample preparation for application of automatic quantitative image analysis to refractory alloys. This paper reports the problems of characterization of the Ni and Fe base alloys to be solved by interference layer metallography and the physical background of this method. The procedure of chromatic contrasting is discussed. From these considerations arises the result that for technical applications the optimum layer material for each special sample should be selected a priori. For that purpose it is necessary to measure the optical constants of the respective structural elements of the alloys as well as those of the candidate layer materials. The measuring procedures are discussed in detail. A routine procedure is deduced which allows to determine a priori the layer material and thickness fitting best to a given problem.

57515 **(MLM—3099) Beta backscatter gauging of PVD copper on 35-mm tape.** Dudley, W.A.; Harvey, E.D. (Monsanto Research Corp., Miamisburg, OH (USA). Mound). 30 Sep 1983. Contract AC04-76DP00053. 20p. NTIS, PC A02/MF A01. Order Number DE84001678.

Mound has developed a Nondestructive Testing (NDT) system to perform automated thickness gauging of very thin (50-200 μin.) copper, vapor-deposited on 35-mm plastic tape using either beta backscatter or eddy current techniques. This report primarily discusses the backscatter development effort, which is currently capable of achieving a precision sigma of 1.2 μin. in a minimum time of approximately 30 sec. Also discussed are planned future efforts to significantly reduce measurement time. In addition, a comparison with results obtained with the eddy current technique is provided.

57516 **(SAND—83-0971) Sizing defects using annular-array techniques with an automatic ultrasonic data-acquisition system.** Gieske, J.H.; Stoker, G.C.; Walkington, P.D. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 15p. (CONF-830811—16). NTIS, PC A02/MF A01. Order Number DE84001644.

From Conference on quantitative NDE; Santa Cruz, CA, USA (7 Aug 1983).

The results of sizing internal flaws by a annular phased array technique are presented. The data was taken using a microprocessor controlled phased array pulser/receiver operated with a minicomputer ultrasonic data acquisition system. Flat bottom holes of two sizes which were machined in an aluminum block at various depths were used as targets. Sizing of these targets by the annular array technique is compared with sizing by conventional flat and focused single transducer techniques. The results show that the measured flaw size determined by the annular array technique is to a large extent independent of echo amplitude and flaw depth.

57517 **(TVA/OP/EDT—83/19) Testing of epoxy-phenolic coating for lining carbon steel pipe.** (Singleton Materials Engineering Labs., Knoxville, TN (USA)). 20 May 1983. 43p. NTIS, PC A03/MF A01. Order Number DE84900073.

A study was completed to evalcate the performance of an epoxy-phenolic coating material when used as an internal liner for carbon steel pipe. Testing of the pipe was identical to that used in a previous study to evaluate cement mortar lined pipe (CEB 810730 003), so that the relative performance of each material could be compared. Pipes were subjected to bearing, cyclic, torsion, flexural, drop, and impact tests, with test sections being inspected before and after testing to evaluate crack formation and propagation as well as adhesion loss.

4206 Safety Engineering

REFER ALSO TO CITATION(S) 57353, 57354

57518 **(KFK—3535) Annual report 1982 of the Central Safety Department.** Kiefer, H.; Koelzer, W.; Koenig, L.A. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Apr 1983. 288p. (In German). NTIS (US Sales Only), PC A13/MF A01. Order Number DE83751163.

The Safety Officer and the Security Officer are responsible for radiation protection and technical safety, both conventional and nuclear, for the physical protection as well as the safeguards of nuclear materials and radioactive substances within the Kernforschungszentrum Karlsruhe GmbH (KfK). To fulfill these functions they rely on the assistance of the Safety Department. The duties of this Department cover tasks relative to radiation protection, safety and security on behalf of the institutes and departments of KfK and environmental monitoring for the whole Karlsruhe Nuclear Research Center as well as research and development work, mainly performed under the Nuclear Safety Project. The centers of interest of r + d activities are: investigation of the atmospheric diffusion of nuclear pollutants on the micro- and meso-scales, evaluation of the radiological consequences of accidents in reactors under probabilistic aspects, studies of the physical and chemical behavior of radionuclides with particularly high biological effectiveness in the environment, improvements in radiation protection measurement technology. This report gives details of the different duties, indicates the results of 1982 routine tasks and reports about results of investigations and developments of the working groups of the Department. The reader is referred to the English translation of the Table of Contents and of Chapter 1 describing the duties and organization of the Central Safety Department.

4208 Electronic Circuits And Devices

57519 **(CONF-8309157—2) Effect of ionization processes on the corona stabilization breakdown in SF_6 and SF_6 mixtures.** Lakdawala, V.K.; James, D.R.; Christophorou, L.G. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE84000688.

From 4. international symposium on high voltage engineering; Athens, Greece (5 Sep 1983).

Breakdown strengths of mixtures of SF_6 with small percentages of hydrocarbon additives in rod-plane gaps for positive impulse and direct applied voltages are reported for pressures ranging from 50 to 700 kPa. The observed significant enhancement in the corona stabilization of some SF_6/hydrocarbon mixtures is discussed in relation to increased ionization. The role of electron impact, Penning, and photon ionization processes is discussed.

57520 **(DOE/ET/29060—1) Solid-state surve recorder. Final report, November 15, 1975-April 1, 1977.** Humphreys, D.R. (General Electric Co., Pittsfield, MA (USA). High Voltage Lab.). 1977. Contract AC01-76ET29060. 98p. NTIS, PC A05/MF A01. Order Number DE84001007.

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The device can record the waveforms of the fast high-current surges produced by lightning in electric power distribution systems. Being portable, rugged, battery-powered, and weatherproof, it has the potential of being a useful general-purpose transient recorder. The recorder rapidly samples the input waveform (at a maximum rate of 5 MHz), electronically stores the samples (for 13.6 ms), and records them slowly (at 5 KHz) in analog form on a standard audio tape cassette. It also records the date and time of the event digitally. A rechargeable battery pack can provide power for a year's operation outdoors. The recorder is in a weatherproof 19 x 11 x 7 in. steel housing and weighs 29 lbs. The current probe is a 3-1/2 x 6-1/2 x 7 in. box weighing 13 lbs. Both probe and main housing are double-shielded. The device operates reliably in the high fields generated by 100 kA currents with submicrosecond rise times. Indoor and outdoor testing of the prototype demonstrates the practicality of its basic circuitry. 11 figures.

57521 **(ORNL/Sub—79-21453/15) 60 GHz gyrotron development program. Quarterly report No. 15, January-March 1983.** Shively, J.F.; Bier, R.E.; Caplan, M.; Choi, E.K.; Craig, L.J.; Evans, S.J.; Felch, K.L.; Fox, L.J.; Hu, G.; Huey, H.E. (Varian Associates, Inc., Palo Alto, CA (USA)). 1983. Contract W-7405-ENG-26. 73p. NTIS, PC A04/MF A01. Order Number DE84001242.

The objective of this program is to develop a microwave oscillator capable of producing 200 kW of CW power at 60 GHz. Additional calculations for stepped cavity designs are reported. The work on collector fatigue improvement has continued. Window work has stressed the implementation of an FC-75 chilling system and the thermal imaging system for viewing the window temperature. Extensive measurements were made on the output window of the 56 GHz CW gyrotron using three systems. Further investigations of three water load approaches are described.

57522 **Laser processing of semiconductor materials.** Young, R.T.; Wood, R.F. (Oak Ridge National Lab., TN). *Annual Review of Materials Science;* **12**: 323-350(1982). Contract W-7405-ENG-26.

The use of high power lasers in a variety of materials processing steps is a rapidly growing technology. Well-developed applications include drilling, cutting, and welding; applications still being developed include surface alloying, laser shock hardening, and laser glazing. More recently, the use of laser radiation for processing semiconductor materials and in a variety of device fabrication steps has received widespread attention. This review describes the developments in laser processing of semiconductors during the past four years. 120 references, 8 figures.

4210 Combustion Systems

REFER ALSO TO CITATION(S) 56871, 56878, 56881, 56884, 56886, 56887

57523 **(DOE/ET/12307—1433) Design, construction, operation and evaluation of a Prototype Culm Combustion Boiler/Heater Unit. Quarterly technical progress report, October 1-December 31, 1982.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Jan 1983. Contract AC21-78ET12307. 20p. (CW-WR—78-036.72). NTIS, PC A02/MF A01. Order Number DE84001059.

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This report provides a summary of the work performed on the Prototype Culm Combustion Boiler/Heater Unit, Phase I - Engineering Design and Analysis, Phase II - Prototype Plant Construction and Phase III - Start-Up and Operation during the period October 1, 1982 through December 31, 1982. The objectives of the program as well as the technical progress and problem areas encountered during the reporting period are presented. The Extended Test Program continued throughout the reporting period. A planned shutdown for installation of additional boiler freeboard refractory occurred in mid-December after which operation resumed. An additional 1824-1/2 hours of operation were accumulated during the reporting period bringing the total boiler operating time through the end of this quarter to 7580 hours. The plant availability from the start-up on August 9, 1982 up to the mid-December shutdown continued very high at 99.75%. The results of the plant inspection and maintenance during the mid-December shutdown are discussed. Steam was delivered to the User (Cellu Products) during this time to generate steam revenue.

57524 **(DOE/ET/12307—1434) Design, construction, operation and evaluation of a Prototype Culm Combustion Boiler/Heater Unit. Quarterly technical progress report, January 1-March 31, 1983.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). May 1983. Contract AC21-78ET12307. 20p. (CW-WR—78-036.76). NTIS, PC A02/MF A01. Order Number DE84001058.

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This report provides a summary of the work performed on the Prototype Culm Combustion Boiler/Heater Unit, Phase I - Engineering Design and Analysis, Phase II - Prototype Plant Construction and Phase III - Start-Up and Operation during the period January 1, 1983 through March 31, 1983. The objectives of the program as well as the technical progress and problem areas encountered during the reporting period are presented. The Extended Test Program continued throughout the reporting period. An additional 2019-1/2 hours of operation were accumulated during the reporting period bringing the total boiler operating time through the end of this quarter to 9600 hours. The plant availability during this quarter has averaged 93.5%. Steam was delivered to the User (Cellu Products) during this time to generate steam revenue. A test of bituminous waste is planned during the next month.

57525 **(DOE/ET/12307—1450) Design, construction, operation and evaluation of a prototype culm combustion boiler/heater unit: site evaluation; socio-economic impact.** (Stone and Webster Engineering Corp., New York (USA)). Nov 1981. Contract AC21-78ET12307. 235p. (CW-WR—78-036.11B). NTIS, PC A11/MF A01. Order Number DE84001832.

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It has been proposed to construct a fluidized bed culm combustion boiler/heater unit in the Shamokin, Pennsylvania area. The facility would burn culm from a nearby coal mine and provide steam to an industrial user. The environmental setting of the area prior to development is described, including climatology, air quality, ecology, hydrology, wastes, noise, land use, socioeconomics, and geology and subsurface conditions. The environmental impacts of the proposed action are then evaluated as related to air quality, ecology, hydrology, wastes, noise, and socioeconomics. Measures for mitigating impacts on air quality, wastes, and noise are briefly described, and possible environmental effects that cannot be avoided are briefly enumerated. (LEW)

57526 **(DOE/ET/12307—1469) Design, construction, operation and evaluation of a Prototype Culm Combustion Boiler/Heater Unit. Quarterly technical progress report, April 1-June 30, 1983.** (Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.). Aug 1983. Contract AC21-78ET12307. 20p. (CW-WR—78-036.79). NTIS, PC A02/MF A01. Order Number DE84001057.

This report provides a summary of the work performed on the Prototype Culm Combustion Boiler/Heater Unit, Phase I - Engineering Design and Analysis, Phase II - Prototype Plant Construction and Phase III - Start-Up and Operation during the period April 1, 1983 through June 30, 1983. The objectives of the program as well as the technical progress and problem areas encountered during the reporting period are presented. The Extended Test continued throughout April after which the plant was shutdown for final inspection and preparation for storage. An additional 528-1/2 hours of operation were accumulated during April bringing the total boiler operating time through the end of this quarter to 10,128 hours. Steam was delivered to the User (Cellu Products) during this time to generate steam revenue. During this period, a stack emission test was conducted which indicated particulate emissions well below the state requirement. Also, a short (100 hrs.) feasibility test was conducted using bituminous waste (gob) as fuel. The test demonstrated the successful combustion and sulfur capture characteristics of the fluidized bed combustion of this low heating value (3000 Btu/lb.), high sulfur (5%) fuel type. Data analysis and report preparation has continued throughout the period. A compilation of economic operating cost data was completed and forwarded to DOE and to Gilbert Associates of Reading, Pennsylvania for use in preparation of an operating cost analysis for the Shamokin Fluidized Bed Boiler.

57527 **(DOE/PC/40272—T4) Mechanisms of fouling, slagging, and corrosion by pulverized-coal combustion. Quarterly technical progress report No. 7, April 1-July 1, 1983.** Hsu, L.L. (Solar Turbines, Inc., San Diego, CA (USA)). Jul 1983. Contract AC22-81PC40272. 43p. NTIS, PC A03/MF A01. Order Number DE83018195.

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Control techniques to reduce particulate fouling of heat exchanger tubes were employed. The first control experiment used

one part SiO_2 (10 micron diameter average) mixed in with 10 parts Glass 4.4. Preliminary analysis indicates some reduction of fouling deposits especially on the lower temperature tubes. It is believed that the mechanism whereby the rate of fouling may be reduced is due to agglomeration and partial fusing of angular refractory SiO_2 particles with glass spheres to form irregular composites that are less susceptible to softening/reactions which generally lead to fouling. This phenomenon will be investigated in greater detail. Microstructural analysis of fouling by pure SiO_2 revealed morphological features in the Croloy and SA 210 tubes that confirmed the previously suggested fact that fouling can be enhanced by corrosion processes. The resulting microstructure showed SiO_2 firmly embedded in the iron oxide scale. In the case of Fe_2O_3 as the fouling medium, target temperature was found to be the single most significant factor in fouling. Examination of glass deposits on Hastelloy X from two experiments in which the target temperature was at 2000°F and 1600°F showed the formation of a fully slagged glass layer at the higher temperature while the glass deposits on the cooler tube were individual spheres. This is further evidence of the critical significance of temperature.

57528 **Flow, mixing and combustion within the quarl of a swirled, pulverised-coal burner.** Truelove, J.S.; Wall, T.F.; Dixon, T.F.; Stewart, I.McC. (Univ. of Newcastle, Australia). *Symposium (International) on Combustion, [Proceedings]*; 1181-1187(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Measurements are presented of the flow pattern and mixing within the quarl of a 1/9th-scale air model of a brown coal burner. For flow conditions within the range used in operating burners, two flow types were observed: one, previously reported, where the primary (coal-laden) flow is deflected gradually around a central, swirl-induced, reverse-flow zone; the other, where the primary flow partially penetrates the reverse-flow zone before being deflected rapdily in the radial direction. The combustion behaviour of the coal in each type of flow is predicted by a computational model, and the results compared with limited measurements on an industrial burner. The second type of flow is shown to mix the coal-laden primary flow with the internal reverse flow before mixing with the secondary air flow, resulting in a higher evolution of volatiles and the ignition of a greater proportion of the char mass. The temperature field within the quarl is shown to be dominated by the temperature of the reverse flow.

4240 Pollution Control Equipment

57529 **(N—8321644) Effects of plate spacing on the efficiency of an electrostatic precipitator.** Weber, E. (Central Electricity Generating Board, London (UK)). Oct 1982. 15p. Avail: British Library Lending Div., Boston Spa, Engl.

Transl. into English from Staub (West Germany), V. 40, No. 11, Nov. 1980, p 469-473.

The effect of plate spacing on the efficiency of an electrostatic precipitator was investigated. For that purpose, laboratory experiments were performed on a test precipitator with variable plate spacing of up to 715 mm. A proportionality was found between the migration velocity and the plate spacing. Apart from the current/voltage characteristics, also the rise in migration velocity with increasing gas velocity was determined. A laser device was used to measure dust concentration profiles which indicate an approximately linear increase from the centre of the duct towards the precipitation electrode. Optimization of electrostatic precipitators by enlarging the plate spacing appears to be possible.

4250 Power Cycles

57530 **(N—8321511) Applications guide for waste heat recovery. Final Report, May-Dec. 1982.** Moynihan, P.I. (Jet Propulsion Lab., Pasadena, CA (USA)). Jan 1983. 81p. (NASA-CR—170121; JPL-PUBL—83-7). NTIS, PC A05/MF A01.

The state-of-the-art of commercially available organic Rankine cycle (ORC) hardware from a literature search and industry survey is assessed. Engineering criteria for applying ORC technology are established, and a set of nomograms to enable the rapid sizing of the equipment is presented. A comparison of an ORC system with conventional heat recovery techniques can be made with a nomogram developed for a recuperative heat exchanger. A graphical technique for evaluating the economic aspects of an ORC system and conventional heat recovery method is discussed: also included is a description of anticipated future trends in organic Rankine cycle R D.

43 PARTICLE ACCELERATORS

57531 **(DOE/ER—0176) Assessment of the adequacy of US accelerator technology for Department of Energy missions.** Gerry, E.T.; Mani, S.A. (Schafer (W.J.) Associates, Inc., Wakefield, MA (USA)). Sep 1983. Contract AC01-82ER40075. 109p. NTIS, PC A06/MF A01. Order Number DE84001632.

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Accelerator technology has made enormous impact across a wide field of research, industrial, and commercial endeavor and new developments are projected to broaden this technology transfer and open up new applications not previously possible or economically attractive. At the same time, however, the broad multiagency base of support for the development of accelerator technology has largely evaporated leaving the program with the Department of Energy (DOE) Office of Energy Research (OER) as the only major National effort not directed at specific narrow applications. In order to continue to reap the benefits and spin-offs from this area of technology, an expanded long-term funding committment is vigorously endorsed since there appear to be major payoff potential in several areas of national need. Three specific recommendations are made that would accelerate the projected benefits from accelerator technology. An expanded effort should be undertaken to develop the key technologies of high brightness, high current, large area, long life, reliable ion, electron and RF sources along with associated studies directed toward accelerator design optimization. A centralized computational facility with a dedicated staff and library of programs for simulation of accelerator phenomenology should be created similar to that for the magnetic fusion program. Advanced accelerator R and D should be funded at a steady level to support a long range accelerator applications program.

4301 Design, Development, And Operation

57532 **(CAPE—2880) SLAC tuning section for resonant ring (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 9 Mar 1983. Contract AC03-76SF00515. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

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The subassembly drawing and the drawings referenced thereon and on the auxiliary drawing list provide the data and specifications for constructing a resonant ring tuning section as used for high power testing of waveguide components. This tuner is designed for high vacuum low loss and high circulating powers.

57533 **(CONF-8309156—1) ASPUN, Argonne Super Intense Pulsed Spallation Neutron source.** Khoe, T.K.; Kustom, R.L. (Argonne National Lab., IL (USA)). 1983. Contract W-31-109-ENG-38. 10p. NTIS, PC A02/MF A01. Order Number DE84000311.

From 7. meeting of the international collaboration on advanced neutron sources; Ontario, Canada (12 Sep 1983).

Argonne has been in the process of developing plans for pulsed spallation neutron source facilities that would extend the flux levels by at least an order or magnitude over fluxes provided by facilities that are either now in operation or in construction. The ANL facility is called ASPUN for Argonne Super Intense Pulsed Spallation Neutron Source. The heart of ASPUN is a Fixed-Field Alternating Gradient (FFAG) proton synchrotron which, in our opinion, has great potential as a driver for a spallation neutron

source. The FFAG synchrotron was extensively studied in the 1950's and early 1960's at the Midwestern Universities Research Association (MURA) laboratories in Stoughton, Wisconsin. An FFAG accelerator has dc excited magnetic fields into which beam is injected on the inside radius and as the beam is accelerated, the average equilibrium orbit radius grows. Frequency modulated rf cavities are used to accelerate the beam with a voltage and frequency program that tracks the beam energy. The conceptual design of the FFAG synchrotron is given. (WHK)

57534 **(SAND—83-0223C) Low-inductance, dual-feed diode development.** Hedemann, M.A.; Stark, M.A.; Reilly, J.P.; Spence, P.W.; Kishi, H. (Sandia National Labs., Albuquerque, NM (USA); Pulse Sciences, Inc., San Leandro, CA (USA)). 1983. Contract AC04-76DP00789. 18p. (CONF-830911—16). NTIS, PC A02/MF A01. Order Number DE84000117.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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We have tested three low-inductance, sub-ohm impedance diode configurations on the SNLA SPEED pulse generator at power levels above 1 TW. SPEED is a single module, ≈ 20 nsec FWHM accelerator with a .4 ohm triaxial power flow transmission line in the water section and a double-sided vacuum-water insulator at a radius of 53 cm. In these experiments, the dual feed was continued with a triplate disk arrangement down to a diode radius of 4 cm, resulting in a load inductance of 5 nH. The diodes were configured to operate in a Langmuir-Childe's bipolar mode, a paravector potential mode, and a double pinched beam mode. We observed pulses with V = 900 kV, I = 1.5 MA, and pulse width = 19 nsec FWHM at the diode. Diode impedance was governed by plasma gap closure; closure velocities of ~ 7 cm/μsec can be inferred from the data. In addition, a 4 nsec difference in the arrival time of the waves at the diode from the two feed lines was found to significantly perturb the expected diode performance. Diode performance improved markedly when the two feed lines were isolated from each other.

4302 Beam Dynamics, Field Calculations, And Ion Optics

REFER ALSO TO CITATION(S) 57555, 57560, 57566, 57567, 57568

57535 **(CAPE—2878) SLAC High Z slit (6 SL-1) (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 24 Feb 1976. Contract AC03-76SF00515. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

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The drawings listed on the Drawing List provide the data and specifications for constructing a High Z Slit as used at SLAC in a typical beam line in the beam switchyard. This device is used to shape the beam and to define it by absorbing the unwanted parts of the beam. High Z means that relatively short lengths provide nearly total absorption of the unwanted portions.

57536 **(LA-UR—83-2588) Ring accelerators.** Gisler, G.; Faehl, R. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830911—23). NTIS, PC A02/MF A01. Order Number DE84001357.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

We present two-dimensional simulations in (r-z) and r-θ) cylinderical geometries of imploding-liner-driven accelerators of rings of charged particles. We address issues of azimuthal and longitudinal stability of the rings. We discuss self-trapping designs in which beam injection and extraction is aided by means of external cusp fields. Our simulations are done with the 2-1/2-D particle-in-cell plasma simulation code CLINER, which combines collisionless, electromagnetic PIC capabilities with a quasi-MHD finite element package.

57537 **(LA-UR—83-2702) PATH: a lumped-element beam-transport simulation program with space charge.** Farrell, J.A. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-8309144—5). NTIS, PC A02/MF A01. Order Number DE84001330.

From EPS conference on computing in accelerator design and operation; Berlin, F.R. Germany (20 Sep 1983).

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PATH is a group of computer programs for simulating charged-particle beam-transport systems. It was developed for evaluating the effects of some aberrations without a time-consuming integration of trajectories through the system. The beam-transport portion of PATH is derived from the well-known program, DECAY TURTLE. PATH contains all features available in DECAY TURTLE (including the input format) plus additional features such as a more flexible random-ray generator, longitudinal phase space, some additional beamline elements, and space-charge routines. One of the programs also provides a simulation of an Alvarez linear accelerator. The programs, originally written for a CDC 7600 computer system, also are available on a VAX-VMS system. All of the programs are interactive with input prompting for ease of use.

57538 **(LA-UR—83-2703) ARCHSIM: a proton-synchrotron tracking program, including longitudinal space charge.** Thiessen, H.A.; Warren, J.L. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-8309144—4). NTIS, PC A02/MF A01. Order Number DE84001335.

From EPS conference on computing in accelerator design and operation; Berlin, F.R. Germany (20 Sep 1983).

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A particle-tracking program has been written for simulating the acceleration cycle of a rapid-cycling proton synchrotron. A lattice can consist of up to 100 cells and rf cavities. Transport of the beam in six dimensions includes all second-order optical terms. The rf field and proton velocity are treated exactly. Longitudinal space charge is handled in a self-consistent manner. The fluctuations due to the finite number of particles are handled by a Gaussian smoothing algorithm. The program runs on a VAX 11/780 and can track 100 particles without space charge through the full acceleration cycle from 0.8 to 32 GeV in 49 minutes. A thousand particles with space charge takes about ten hours of computer time.

57539 **(SAND—83-1963C) IBEX - annular beam propagation experiment.** Mazarakis, M.G.; Miller, R.B.; Shope, S.L.; Poukey, J.W.; Ramirez, J.J.; Ekdahl, C.A.; Adler, R.J. (Sandia National Labs., Albuquerque, NM (USA); Mission Research Corp., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-830911—22). NTIS, PC A02/MF A01. Order Number DE84000456.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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IBEX is a 4-MV, 100-kA, 20-ns cylindrical isolated Blumlein accelerator. In the experiments reported here, the accelerator is fitted with a specially designed foilless diode which is completely immersed in a uniform magnetic field. Several diode geometries have been studied as a function of magnetic field strength. The beam propagates a distance of 50 cm (~ 10 cyclotron wavelengths) in vacuum before either striking a beam stop or being extracted through a thin foil. The extracted beam was successfully transported 60 cm downstream into a drift pipe filled either with 80 or 640 torr air. The main objectives of this experiment were to establish the proper parameters for the most quiescent 4 MV, 20 to 40 kA annular beam, and to compare the results with available theory and numerical code simulations.

57540 **(SLAC/AP—6) Motion of ionized electrons under the intense electromagnetic field of the beam.** Kamiya, Y. (Stanford Linear Accelerator Center, CA (USA)). Sep 1983. Contract AC03-76SF00515. 9p. NTIS, PC A02/MF A01. Order Number DE84001396.

The motion of an electron ionized from residual gas by the beam becomes relativistic in the case of a high-density beam as in SLC, while the ions produced by the beam remain nonrelativistic.

The ionized relativistic electron will be dragged by the beam, and will go away from the beam (electron beam) before the beam passes, even for the very short bunch of SLC. In this note, we discuss the motions of electrons ionized by the electron beam or by the positron beam. We assume that the density of the beam is uniform and the shape cylindrical (transversely round and longitudinally rectangular).

57541 **(SLAC-PUB—3173) Wake force computation in the time domain for long structures.** Bane, K.; Weiland, T. (Stanford Linear Accelerator Center, CA (USA); Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Jul 1983. Contract AC03-76SF00515. 3p. (CONF-830822—30). NTIS, PC A02/MF A01. Order Number DE84000991.

From 12. international conference on high energy accelerators; Batavia, IL, USA (11 Aug 1983).

One is often interested in calculating the wake potentials for short bunches in long structures using TBCI. For ultra-relativistic particles it is sufficient to solve for the fields only over a window containing the bunch and moving along with it. This technique reduces both the memory and the running time required by a factor that equals the ratio of the structure length to the window length. For example, for a bunch with $\sigma/sub\ z/$ of one picosecond traversing a single SLAC cell this improvement factor is 15. It is thus possible to solve for the wakefields in very long structures: for a given problem, increasing the structure length will not change the memory required while only adding linearly to the CPU time needed.

57542 **(SLAC-PUB—3175) Comparison between experimental and theoretical results for the fast-head-tail instability in PEP.** (Stanford Linear Accelerator Center, CA (USA)). Jul 1983. Contract AC03-76SF00515. 4p. (CONF-830822—29). NTIS, PC A02/MF A01. Order Number DE84000990.

From 12. international conference on high energy accelerators; Batavia, IL, USA (11 Aug 1983).

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The fast-head-tail instability has been observed at several storage rings. This is a single-bunch beam instability where the unstable motion can occur in either the horizontal or vertical plane. Kohaupt and Talman have offered a simplified treatment of this instability by modeling the bunch as two rigid macroparticles executing synchrotron oscillations and thus exchanging their longitudinal positions periodically. While the wake field forces which drive the fast-head-tail instability are the same ones which drive the slow-head-tail instability, the growth mechanism is considerably different. The two particle model describes the particle motion with two normal modes; below a certain stability threshold, these two modes are stable with different frequencies. In the limit of zero beam current only one of these modes has a center-of-charge motion. However, as the current is increased, both modes acquire center-of-charge motions and at threshold the center-of-charge components of their motions become equal in magnitude, thus when the center-of-charge motion is excited by an impulse as by an injection kicker, the relative amplitude of the two modes depends upon the ratio of bunch current to the threshold current. We shall describe the character of this coherent motion both theoretically and experimentally.

57543 **(SLAC-PUB—3184) Optical distortions in electron/positron storage rings.** Brown, K.L.; Donald, M.; Servranckx, R. (Stanford Linear Accelerator Center, CA (USA); Saskatchewan Univ., Saskatoon (Canada)). 1983. Contract AC03-76SF00515. 3p. (CONF-830822—31). NTIS, PC A02/MF A01. Order Number DE84000992.

From 12. international conference on high energy accelerators; Batavia, IL, USA (11 Aug 1983).

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We have studied the optical distortions in the PEP electron/positron storage ring for various optical configurations using the computer programs DIMAT, HARMON, PATRICIA, and TURTLE. The results are shown graphically by tracing several thousand trajectories from one interaction region to the next using TURTLE and by tracing a few selected rays several hundred turns using the programs DIMAT and PATRICIA. The results show an interesting correlation between the calculated optical cleanliness of a particular lattice configuration and the observed operating characteristics of the machine.

57544 **Transverse-longitudinal coupling in intense beams.** Wang, T.F.; Smith, L. (California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Particle Accelerators;* 12: No. 4, 247-260(Dec 1982).

The coupling between longitudinal and axially symmetric transverse perturbations is studied self-consistently by considering a beam of K-V distribution. The analysis is carried out within the context of linearized Vlasov-Maxwell equations and electrostatic approximation. It is shown that the coupling affects both the longitudinal and transverse modes significantly in the high-density, low-frequency region. In the medium and low density region, separate treatment of longitudinal and transverse modes tends to be a good approximation. A new class of 'coupling modes' is found that would not exist if the transverse motions of particles were neglected. The effect of resistive wall impedance on beam stability is also studied. It is found that the longitudinal impedance can also cause a few transverse modes to be weakly unstable.

57545 **(LA-tr—83-17) Longitudinal compression of ion beams.** Barkhudarian, A.V.; Koshkarev, D.G. (Los Alamos National Lab., NM (USA); Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow. Inst. Teoreticheskoj i Ehksperimental'noj Fiziki). 1982. Contract W-7405-ENG-36. Translation of ITEF-25(1982). 15p. NTIS, PC A02/MF A01. Order Number DE84001205.

This paper examines the longitudinal compression of ion beams which is necessary in some designs of drivers intended to realize inertial thermonuclear fusion by heavy ions. Taking space-charge forces in the beams into account, two compression schemes are investigated: the first preserves the longitudinal phase-space area of the beams, and the second allows an increase of the phase-space area. The compression-system parameters are optimized for an example of a driver for inertial thermonuclear fusion by heavy ions with an energy of 10 MJ and with a pulse length of 25 ns on the target.

4303 Auxiliaries And Components

REFER ALSO TO CITATION(S) 57508, 57533, 57585, 57586

57546 **(ANL-HEP-CP—83-48) Calibration of the high resolution spectrometer barrel calorimeter at PEP.** Loos, J.S. (Argonne National Lab., IL (USA)). 1983. Contract W-31-109-ENG-38. 47p. (CONF-8304126—1). NTIS, PC A03/MF A01. Order Number DE84000594.

From Calorimeter calibration workshop; Batavia, IL, USA (29 Apr 1983).

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The High-Resolution Spectrometer (HRS) is a general-purpose detector for the study of high-energy electron-positron collisions. The HRS has been in data-taking operation since early 1982. This report covers the calibration of the barrel shower counter system. The barrel system consists of 40 modules placed in a circular arch having a mean radius of 2.1 m. Each module covers an azimuthal wedge of 9 degrees and has an active length of 3.0 m. There are three independent sections: (1) an inner sandwich of Pb and scintillator (NE110) of thickness 3 r.l., (2) a plane of 14 proportional wire cells equipped with charge-division read-out, and (3) an outer sandwich of Pb and scintillator (NE114) of thickness 8. r. l. The light from the sandwich section is collected at both ends and is passed through long acrylic pipes (5 cm diameter, 162 cm long) to photomultipliers (Amperex XP2230) mounted outside the magnet steel.

57547 **(CAPE—2876) SLAC-standard CAMAC branch terminator (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 4 Apr 1980. Contract AC03-76SF00515. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

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The drawings listed on the drawing list provide the data and specifications for constructing a Branch Terminator for the SLAC standard CAMAC units. This is a device for matching the cables and other branch lines in the system. This unit is designed for a certain group of SLAC CAMAC units which are referred to as SLAC-Standard CAMAC Units.

57548 **(CAPE—2879) SLAC Intermediate Beam Dump - divergent chamber (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 9 Jul 1965. Contract AC03-76SF00515. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

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The drawings listed on the Auxiliary Drawing List provide the data and specifications for the SLAC Intermediate Dump Baffle as used in the beam switchyard at SLAC. This dump absorbs and expands the beam and the beam generated particle shower. It is associated with the divergent chamber which allows switching of the beam to different beam lines in the beam switchyard and experimental area.

57549 **(CONF-830874—28) High-sensitivity laser spectroscopy with atoms from a cooled helium jet.** Lewis, D.A.; Evans, R.M.; Davids, C.N.; Finn, M.A.; Kaufman, S.L.; Greenlees, G.W. (Iowa State Univ. of Science and Technology, Ames (USA). Dept. of Physics; Argonne National Lab., IL (USA); Minnesota Univ., Minneapolis (USA). Dept. of Physics). 1983. Contract W-31-109-ENG-38. 8p. NTIS, PC A02/MF A01. Order Number DE84000614.

From 27. annual international technical symposium on high speed photography, videography and photonics; San Diego, CA, USA (21 Aug 1983).

We have developed a cryogenic He-jet system which efficiently transports radioactive atoms produced on-line at the Argonne National Laboratory Tandem-Linac Accelertor away from the production region and forms them into a cool atomic beam. This atomic beam will be probed with high sensitivity laser spectroscopy using the photon burst method. The ultimate goal of this work is to determine the sizes, shapes, and magnetic moments of short-lived nuclei through their atomic hyperfine structure. Preliminary measurements with the He-jet system and the adaption of the photon burst method to this new geometry are described.

57550 **(CONF-8309144—3) Operator interface to the ORIC control system.** Ludemann, C.A.; Casstevens, B.J. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 7p. NTIS, PC A02/MF A01. Order Number DE84000335.

From EPS conference on computing in accelerator design and operation; Berlin, F.R. Germany (20 Sep 1983).

The Oak Ridge Isochronous Cyclotron (ORIC) was built in the early 1960s with a hard-wired manual control system. Presently, it serves as a variable-energy heavy-ion cyclotron with an internal ion source, or as an energy booster for the new 25 MV tandem electrostatic accelerator of the Holifield Heavy Ion Facility. One factor which has kept the cyclotron the productive research tool it is today is the gradual transfer of its control functions to a computer-based system beginning in the 1970s. This particular placement of a computer between an accelerator and its operators afforded some unique challenges and opportunities that would not be encountered today. Historically, the transformation began at a time when computers were just beginning to gain acceptance as reliable operational tools. Veteran operators with tens of years of accelerator experience justifiably expressed skepticism that this improvement would aid them, particularly if they had to re-learn how to operate the machine. The confidence of the operators was gained when they realized that one of the primary principles of ergonomics was being upheld. The computer software and hardware was being designed to serve them and not the computer.

57551 **(INIS-mf—8563) Annual Report 1981-1982.** (Rijksuniversiteit Utrecht (Netherlands). Robert van de Graaff Lab.). Jan 1983. 89p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83781090.

Progress in research work performed at the Robert J. van de Graaff Laboratory of the State University at Utrecht during 1981 and 1982 is presented. Chapters are included on the following topics: research with the EN Tandem Accelerator; research with the 3 MV accelerator; nuclear theory; instrumentation; and particle physics. Information concerning publications, preprints, Ph.D. theses, conference contributions, other lectures, internal reports and personnel is also included.

57552 **(KFK—3446) Using a radio frequency quadrupole accelerator in the spallation neutron source.** Lehmann, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Kern- und Teilchenphysik; Karlsruhe Univ. (T.H.) (Germany, F.R.). Fakultaet fuer Elektrotechnik). Mar 1983. 79p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751143.

This paper is part of the work at the Institut fuer Kernphysik (KfK Karlsruhe) on the SNQ project study. It deals with the Radio Frequency Quadrupole (RFQ) structure, which is not yet completely explored. In the RFQ the bottleneck, where the beam current limit is at a minimum, is not located -as it is in ordinary linear accelerators- at the entrance (low energy end); therefore the current can be higher and the injection energy lower. Different RFQ resonators of the Four Vane type are investigated; particularly the sensitivity of the azimuthal field distribution with respect to geometric errors is given quantitatively. New resonators, the sensitivity of which is smaller by one order of magnitude, were found by application of an accelerating structure analogy. An improved RFQ design procedure is described and an RFQ preaccelerator for the Spallation Neutron Source is designed and examined.

57553 **(LA-UR—83-2692) Remote handling at LAMPF.** Grisham, D.L.; Lambert, J.E. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-8309156—5). NTIS, PC A02/MF A01. Order Number DE84001317.

From 7. meeting of the international collaboration on advanced neutron sources; Ontario, Canada (12 Sep 1983).

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Experimental area A at the Clinton P. Anderson Meson Physics Facility (LAMPF) encompasses a large area. Presently there are four experimental target cells along the main proton beam line that have become highly radioactive, thus dictating that all maintenance be performed remotely. The Monitor remote handling system was developed to perform in situ maintenance at any location within area A. Due to the complexity of experimental systems and confined space, conventional remote handling methods based upon hot cell and/or hot bay concepts are not workable. Contrary to conventional remote handling which require special tooling for each specifically planned operation, the Monitor concept is aimed at providing a totally flexible system capable of remotely performing general mechanical and electrical maintenance operations using standard tools. The Monitor system is described. (WHK)

57554 **(LBL—16217) Cryogenic testing of the TPC superconducting solenoid.** Green, M.A.; Smits, R.G.; Taylor, J.D.; van Slyke, V.; Barrera, F.; Petersen, H.;Rago, C.E.; Rinta, R.I.; Talaska, D.; Watt, R.D. (Lawrence Berkeley Lab., CA (USA); Stanford Linear Accelerator Center, CA (USA)). Jun 1983. Contract AC03-76SF00098;AC03-76SF00515. 82p. NTIS, PC A05/MF A01. Order Number DE84000528.

This report describes the results of a series of tests on the TPC superconducting magnet cryogenic system which occurred during the winter and spring of 1983. The tests occurred at interaction region 2 of the PEP colliding beam facility at the Stanford Linear Accelerator Center (SLAC). The TPC Magnet Cryogenic System which was tested includes the following major components: a remote helium compressor with a full flow liquid nitrogen purification station, 400 meters of high pressure supply and low pressure return lines; and locally a CTi Model 2800 refrigerator with two Sulzer gas bearing turbines, the TPC magnet control dewar, 70 meters of transfer lines, and the TPC thin superconducting solenoid magnet. In addition, there is a conditioner (liquid nitrogen heat exchangers and gas heaters) system for cooldown and warmup of the magnet. This report describes the local cryogenic system and describes the various steps in the cooldown and operation of the TPC magnet. The tests were successful in that they showed that the TPC magnet could be cooled down in 24 hours and the magnet

could be operated on the refrigerator or a helium pump with adequate cooling margin. The tests identified problems with the cryogenic system and the 2800 refrigerator. Procedures for successful operation and quenching of the superconducting magnet were developed. 19 references.

57555 **(SAND—83-0590C) Thomson-scattering measurements of electron temperature and density in a plasma channel created by a relativistic electron beam.** Allen, G.R.; Parke Davis, H.; Brandenburg, J.E. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-830911—20). NTIS, PC A02/MF A01. Order Number DE84000356.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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The electron density (n/sub e/) and temperature (T/sub e/) of the plasma channel created by the propagation of a relativistic electron beam in air have been measured by a ruby laser Thomson scattering diagnostic. The measurements were made at the MIMI electron beam accelerator (1.6 MV, 21 kA, 70 ns) at various times during the plasma channel development, with 25 ns temporal resolution and 2 mm radial resolution. For example, in 5 Torr air, at the time of maximum electron beam current, the results are n/sub e/ = 1.86 x 10^{15} cm^{-3} (+- 12%), T/sub e/ = 4.24 eV (+- 20%). These results, as well as those with other timing, are in good agreement with the theoretical results of the Air Propagation Code: n/sub e/ = 1.65 x 10^{15} cm^{-3}, T/sub e/ = 2.59 eV. Signal-to-noise is very good (10:1), limited by x-ray fluorescence of the fiber optics at the spectrometer. In fielding the diagnostic on higher energy accelerators, however, the dominant noise is expected to be the background light from the plasma and hot gas, or the fluorescence of the collecting optics. Improvements to the diagnostic and an ongoing experiment in 80 Torr of air, 4 MV, 50 kA to address these issues is presented.

57556 **(SAND—83-0607C) Tomographic technique in relativistic electron beam experiments.** Chang, J.; Kissel, L.D. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 6p. (CONF-830911—18). NTIS, PC A02/MF A01. Order Number DE84000357.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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A tomographic technique has been developed for diagnosing relativistic electron beams. It offers a nonperturbing and noninvasive method to map the time-dependent 2-D cross section of the beam.

57557 **(SAND—83-0608C) Direct measurement of the energy spectrum of an intense proton beam.** Leeper, R.J.; Lee, J.R.; Kissel, L.; Johnson, D.J.; Stygar, W.A.; Hebron, D.E.; Roose, L.D. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-830911—19). NTIS, PC A02/MF A01. Order Number DE84000457.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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A time-resolved magnetic spectrometer has been used to measure the energy spectrum of an intense (0.5 TW/cm^2) proton beam. A thin (2400 A) gold foil placed at the focus of an ion diode Rutherford scattered protons by 90° into the spectrometer, reducing the beam intensity to a level suitable for magnetic analysis. The scattered beam was collimated by two 1 mm diameter apertures separated by 12.3 cm. The collimated protons were deflected in a 12.7 cm diameter, 6.65 Kg samarium-cobalt permanent magnet. The deflected protons were recorded simultaneously on CR-39 and eight 1 mm^2 by 35 μm thick PIN diodes. A Monte Carlo computer code was used to calculate the sensitivity and resolution of the spectrometer. Data taken on Proto-I show a 150 keV to 250 keV wide proton energy spectrum at each instant in time.

57558 **(SLAC-PUB—3174) Design of the SLC damping ring to linac transport lines.** Fieguth, T.H.; Murray, J.J. (Stanford Linear Accelerator Center, CA (USA)). Jul 1983. Contract AC03-76SF00515. 3p. (CONF-830822—32). NTIS, PC A02/MF A01. Order Number DE84000989.

From 12. international conference on high energy accelerators; Batavia, IL, USA (11 Aug 1983).

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The first and second order optics for the damping ring to linac transport line are designed to preserve the damped transverse emittance while simultaneously compressing the bunch length of the beam to that length required for reinjection into the linac. This design, including provisions for future control of beam polarization, is described.

57559 **Soft X-ray and vacuum ultraviolet beamlines at the National Synchrotron Light Source 700 MeV storage ring.** Williams, G.P.; Howells, M.R. (Brookhaven National Lab., Upton, NY (USA). National Synchrotron Light Source). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 37-42(15 Apr 1983). (CONF-820839—). Contract AC02-76CH00016.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

Also published as report BNL–31874; 1982.

We summarize the characteristics of the first beamlines which are being installed and commissioned at the National Synchrotron Light Source (NSLS) 700 MeV storage ring at Brookhaven National Laboratory. We also give a progress report as of July 1982 on the early stages of beamline alignment and operation in which particular attention is paid to the 5 beamlines which NSLS has developed. The report describes in detail a novel method for beamline alignment which is of general application.

57560 **Optical design for the NSLS crystallography beam line.** Hastings, J.B.; Thomlinson, W. (Brookhaven National Lab., Upton, NY (USA). National Synchrotron Light Source); Suortti, P. (Helsinki Univ. (Finland). Dept. of Physics); Kvick, A.; Koetzle, T.F. (Brookhaven National Lab., Upton, NY (USA). Dept. of Chemistry). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 55-58(15 Apr 1983). (CONF-820839—). Contract AC02-76CH00016.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

The design goal of this beam line is to produce a photon beam well suited to accurate single-crystal diffraction measurements, with particular attention to the possibilities of the use of anomalous dispersion. These goals lead to the following criteria: (1) a beam uniform in intensity to 1% over an area 0.3x0.3 mm^2, (2) $\Delta E/E_{approx.} = 3x10^{-4}$, and (3) tunable over the energy range 5-21 keV accessible from a NSLS bending magnet. These criteria lead to a number of design decisions that have been applied to this and other NSLS beam lines: (1) A mirror is placed as the first optical element to better match the vertical opening angle of the photon beam to the typical rocking curves of low-index silicon Bragg peaks, reducing $\Delta E/E$ in a nondispersive, two-crystal monochromator. (2) With this mirror in place a two-crystal parallel mode monochromator with constant deviation is chosen. (3) A post-mirror to condense the radiation is placed after the monochromator. The entire optical system has been designed to operate in an ultra-high vacuum environment. The details of the mirror designs, coatings and grazing angles are presented as well as other possible choices for these elements. Ray tracing results are given for the crystallography beam line for comparison with the design goals.

57561 **New wiggler beam line for SSRL.** Bahr, C.; Chan, T.; Chin, J.; Elioff, T.; Halbach, K.; Harnett, G.; Hoyer, E.; Humphries, D.; Hunt, D.; Kim, K.J. (Lawrence Berkeley Lab., CA (USA)). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 117-125(15 Apr 1983). (CONF-820839—).

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

A new high intensity beam line with a wiggler magnet source is described. This project, in final stages of design, is a joint effort between Lawrence Berkeley Laboratory (LBL), the Exxon Research and Engineering Company (EXXON), and the Stanford Synchrotron Radiation Laboratory (SSRL). Installation at SSRL will begin in the summer of 1982. The goal of this project is to provide extremely high-brightness synchrotron radiation beams over a broad spectral range from 50 eV to 40 keV. The radiation source is a 27 period (i.e., 55 pole) permanent magnet wiggler of a new design. The wiggler utilizes rare-earth cobalt (REC) material in the steel hybrid configuration to achieve high magnetic fields with short periods. An analysis has been made of the polarization, angular distribution and power density of the radiation produced by the wiggler. Details of the wiggler design are presented. The magnet is outside a thin walled (1 mm) variable gap stainless steel vacuum chamber. The chamber gap will be opened to 1.8 cm for beam injection into SPEAR and then closed to 1.0 cm (or less) for operation. Five remotely controlled drives are provided; to change the wiggler gap, to change the vacuum chamber aperture and to position the wiggler. Details of the beam line optics and end stations are presented. Thermal loading on beam line components is severe. The peak power density at 7.5 m is 5 kW/cm^2 for the nominal wiggler field and present SPEAR beam currents and will approach 20 kW/cm^2 with the maximum wiggler field and projected SPEAR beam currents.

57562 **Undulator studies at SSRL.** Winick, H.; Boyce, R.; Brown, G.; Hower, N.; Pate, T. (Stanford Univ., CA (USA). Stanford Synchrotron Radiation Lab.); Hussain, Z. (Lawrence Berkeley Lab., CA (USA)); Umbach, E. (Technische Univ. Muenchen (Germany, F.R.)). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 127-137(15 Apr 1983). (CONF-820839—). Contract W-7405-ENG-48.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

In a collaboration between LBL and SSRL a permanent magnet ($SmCo_5$) undulator has been designed, constructed and installed into the SPEAR storage ring at SLAC during 1980. A report on the design, construction and magnetic measurements has already been made. This is a report on subsequent work with the undulator. We describe (a) the performance of the undulator as a radiation source, (b) its effect on storage ring operation, (c) the instrumentation developed to facilitate its routine use as a radiation source for experiments, and (d) the experience gained in the first experimental study utilizing the undulator.

4304 Storage Rings

REFER ALSO TO CITATION(S) 57499, 57501, 57542, 57543, 57559, 57561, 57562

57563 **(CAPE—2877) SLAC High Resolution Spectrometer solenoid magnet mapper (Engineering Materials).** (Stanford Linear Accelerator Center, CA (USA)). 12 Dec 1979. Contract AC03-76SF00515. USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830.

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The drawings listed on the Auxiliary Drawing List provide the data and specifications for constructing a SLAC Large High Resolution Spectrometer Solenoid (HRS) Magnet Mapper. This mapper is designed to map (measure) a large number of points in a large solenoidal magnet directly in cylindrical coordinates. The Mapper Assembly is designed to be driven by a computer and the fields in the three directions also measured by a computer controlled device. This unit was used to measure the High Resolution Spectrometer (HRS) used in the PEP Storage Ring. Precise positioning of the magnetic field measuring device is the main benefit of this design. Not all details of the assembly are available on these drawings.

57564 **(DESY—83-028) Dependence of the luminosity on various machine parameters and their optimization at PETRA.** Piwinski, A. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 5p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751272.

The luminosity of a storage ring is determined by the beam currents, by the natural beam size at the interaction points and by the increase in beam height due to the beam-beam interaction. The limitation of the currents, the variation of the beam size and the minimization of the blow-up as predicted by computer simulations are discussed. Results of the optimization of the luminosity in PETRA are shown.

57565 **(LA-UR—83-2592) Proton storage ring (PSR) diagnostics and control system.** Clout, P. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-8309156—3). NTIS, PC A02/MF A01. Order Number DE84001353.

From 7. meeting of the international collaboration on advanced neutron sources; Ontario, Canada (12 Sep 1983).

When any new accelerator or storage ring is built that advances the state of the art, the diagnostic system becomes extremely important in tuning the facility to full specification. This paper will discuss the various diagnostic devices planned or under construction for the PSR and their connection into the control system.

57566 **(LA-UR—83-2593) PSR beam-pulse formation and control.** Hardekopf, R.A. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-8309156—2). NTIS, PC A02/MF A01. Order Number DE84001354.

From 7. meeting of the international collaboration on advanced neutron sources; Ontario, Canada (12 Sep 1983).

The Proton Storage Ring (PSR) is a major addition to the Weapons Neutron Research Facility (WNR) at LAMPF. It will act as a bunch compressor for the relatively long linac macropulses from LAMPF, tailoring them into short, intense pulses ideally suited for neutron-scattering research. This paper concentrates on the methods used to form these pulses before injection into the linac, to multiplex the PSR beam with other LAMPF users, and to synchronize the storage ring with pulse arrival time at injection and with the WNR mechanical neutron chopper at extraction.

57567 **(SLAC-PUB—3182) Beam-beam interaction: luminosity, tails, and noise.** Seeman, J.T. (Stanford Linear Accelerator Center, CA (USA)). Jul 1983. Contract AC03-76SF00515. 6p. (CONF-830822—28). NTIS, PC A02/MF A01. Order Number DE84000933.

From 12. international conference on high energy accelerators; Batavia, IL, USA (11 Aug 1983).

Observations of the beam-beam interaction at SPEAR, CESR, PETRA and PEP are discussed. They are sufficiently similar that a simple prescription can be formulated to describe the behavior of the luminosity as a function of current including the peak values. With this prescription the interpretation of various methods of increasing the luminosity, such as the reduction of the vertical betatron function, the increase of the horizontal beam size, and mini- and micro- beta projects, is straight-forward. Predictions for future storage rings can also be made. Finally, some observations of the consequences of reducing the vertical betatron function to near the value of the bunch length are discussed.

57568 **Wiggler and undulator magnets. A review.** Brown, G.; Winick, H. (Stanford Univ., CA (USA). Stanford Synchrotron Radiation Lab.); Halbach, K. (Lawrence Berkely Lab., CA (USA)); Harris, J. (Stanford Linear Accelerator Center, CA (USA)). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 65-77(15 Apr 1983). (CONF-820839—).

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

With 48 refs.

Wiggler and undulator magnets as radiation sources in electron storage rings are reviewed. The review covers (a) the spectral

properties of wiggler/undulator radiation, (b) the technology available for their construction, (c) the interaction of these devices with the stored electron beam, (d) experience with existing devices, (e) plans for future devices at laboratories around the world and (f) beam line design considerations.

44 INSTRUMENTATION

4401 Radiation Instrumentation

REFER ALSO TO CITATION(S) 56945, 57154, 57546, 57557, 57650

57569 **(DESY—83-023) ARGUS electron/photon calorimeter. Pt. 2.** Drescher, A.; Graf, H.J.; Graewe, B.; Hofmann, W.; Markees, A.; Matthiesen, U.; Spengler, J.; Wegener, D. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 28p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751127.

A detailed investigation is described of the photon production and transport in lead scintillator shower counters with wavelength shifter readout built for the ARGUS detector. Experimental data and Monte Carlo calculations are in good agreement. The most prominent effects due to the light collection system are small nonlinearities in the relation between deposited energy and pulse height and an energy dependent decrease of the energy resolution of the counters.

57570 **(DESY—83-025) ARGUS muon chambers.** Arefiev, A.; Danilov, M.; Gorodkov, Yu.; Lubimov, V.; Semenov, Yu.; Tchistilin, V.; Tichomirov, I.; Zaitsev, Yu. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751126.

The performance of the ARGUS muon chambers is reported. The proportional tube characteristics are described and some test results are presented.

57571 **(KFK—3472) Proposal for a bismuth-germanate detector as a tool for precision measurements in the field of s-process nucleosynthesis.** Kaeppeler, F.; Schatz, G.; Wisshak, K. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik). Feb 1983. 72p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751110.

Very precise neutron capture cross sections are required for a quantitative discussion of nucleosynthesis and in particular for the related cosmological aspects. At present, the various experimental techniques are limited to accuracies around 5% and do not meet the requirements. Therefore, it is proposed to build a 4π bismuth-germanate detector. This provides a reduction of systematic uncertainties and of backgrounds thus allowing for an accuracy of better than 1%. With this technique it becomes possible to improve the data basis for quantitative s-process investigations and to perform for the first time a reliable age determination for the chemical elements. This would improve our knowledge about nucleosynthesis in general, but would also yield empirical constraints for stellar model calculations and would define an important date in the evolution of the universe.

57572 **(PNL-SA—11213) Method to improve the evaluation of a combination track-etch dosimeter/spectrometer.** Brackenbush, L.W.; Parkhurst, M.A.; Hadlock, D.E.; Faust, L.G. (Pacific Northwest Lab., Richland, WA (USA)). Sep 1983. Contract AC06-76RL01830. 5p. (CONF-830969—1). NTIS, PC A02/MF A01. Order Number DE84000113.

From 12. international conference on solid state nuclear track detectors; Acapulco, Mexico (4 Sep 1983).

A paper is summarized which describes a method of determining the neutron energy spectrum through spectrum unfolding techniques to more accurately assess the dose equivalent from track-etch dosimeters. A mathematical technique is described which can be used in conjunction with the neutron detectors to more accurately estimate neutron dose equivalent. The technique is based upon solutions to a system of Fredholm integral equations of the first type. (LEW)

57573 **(PTB-Dos—6) Actual problems of dosimetry for photon radiation in radiation therapy and diagnostics.** Hohlfeld, K.; Reich, H. (Physikalisch-Technische Bundesanstalt, Braunschweig (Germany, F.R.). Gruppe Photonen- und Elektronendosimetrie). Dec 1981. 113p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751273.

Representatives from industry, hospital physicists, representatives from national bureau of standards as well as from the PTB participated in this seminar. This report contains all seminar papers. Two developments had lead to the seminar: 1st the upcoming activation of an obligation for calibration of therapy dosimeters and 2nd the transition to SI-units in radiology and the corresponding transition to other units. Especially the discussion of the first subject brought up strong contradictory opinions. Hopefully they will have an influence on the decisions for further development of calibration obligations.

57574 **(SLAC-PUB—3131) Search for the best timing strategy in high-precision drift chambers.** Va'vra, J. (Stanford Linear Accelerator Center, CA (USA)). Jun 1983. Contract AC03-76SF00515. 19p. (CONF-8306110—2). NTIS, PC A02/MF A01. Order Number DE84000928.

From 2. Pisa meeting on advanced detectors; Castiglione della Pescaia, Italy (2 Jun 1983).

Computer simulated drift chamber pulses are used to investigate various possible timing strategies in the drift chambers. In particular, the leading edge, the multiple threshold and the flash ADC timing methods are compared. Although the presented method is general for any drift geometry, we concentrate our discussion on the jet chambers where the drift velocity is about 3 to 5 cm/μsec and the individual ionization clusters are not resolved due to a finite speed of our electronics.

57575 **Application of synchrotron radiation to high resolution powder diffraction and Rietveld refinement.** Cox, D.E.; Hastings, J.B.; Thomlinson, W. (Brookhaven National Lab., Upton, NY (USA)); Prewitt, C.T. (State Univ. of New York, Stony Brook (USA)). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 573-578(15 Apr 1983). (CONF-820839—). Contract AC02-76CH00016.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

X-ray powder diffractometer techniques have been used at the Cornell High Energy Synchrotron Source (CHESS) to investigate the application of synchrotron radiation to high resolution powder diffraction, with particular emphasis on the Rietveld method for structure analysis. The resolution characteristics have been explored for a configuration consisting of a double crystal Si(220) monochromator scattering in the vertical plane and a Philips diffractometer modified to accept a Si(111) analyzer which is mounted before the detector and acts as a high angular resolution slit. With 1.54 A X-rays, the resolution is roughly 2-4 times better than that of a conventional focusing diffractometer using Cu Kα radiation, and is dominated by the vertical divergence of the beam (approx.= 0.1 mrad). Data have been collected from several reference materials, including Si, CeO_2 and Bi_2O_3. Analysis of the peaks revealed that these were neither Gaussian nor Lorentzian in shape. As in the case of conventional sources, a convolution of the two functions provided a much better fit. Rietveld refinement of the structure of Bi_2O_3, which has a monoclinic cell with a number of closely overlapping reflections and fifteen positional parameters, was successfully accomplished.

57576 **High-resolution X-ray scattering.** Moncton, D.E. (Brookhaven National Lab., Upton, NY (USA); Bell Labs., Murray Hill, NJ (USA)); Brown, G.S. (Stanford Univ., CA (USA). Stanford Synchrotron Radiation Lab.). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 579-586(15 Apr 1983). (CONF-820839—). Contract AC02-76CH00016.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

Also published as report BNL–32304; 1982.

Beamline and spectrometer instrumentation for high-resolution X-ray scattering at the Stanford Synchrotron Radiation Laboratory is described. The combination of photon intensity at the sample of approx.= 10^{13} photons/s 10 mm^2 and the momentum transfer resolution of ΔQapprox.=10^{-4} A^{-1} make this a unique facility. Examples are given of data obtained on two-dimensional phase transitions both in studies of thin (2 molecular layers) liquid crystal films and rare gas monolayers on pyrolytic graphite substrates.

57577 **Photoelectron spectrometer for high resolution angular resolved studies.** Parr, A.C.; Southworth, S.H. (National Bureau of Standards, Washington, DC (USA). Synchrotron Ultraviolet Radiation Facility); Dehmer, J.L. (Argonne National Lab., IL (USA)); Holland, D.M.P. (Maryland Univ., College Park (USA). Inst. for Physical Science and Technology). *Nuclear Instruments and Methods in Physics Research;* 208: No. 1-3, 767-770(15 Apr 1983). (CONF-820839—).

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

We report on a new electron spectrometer system designed for use on storage ring light sources. The system features a large (76 cm diameterx92 cm long) triply magnetically shielded vacuum chamber and two 10.2 cm mean radius hemispherical electron energy analyzers. One of the analyzers is fixed and the other is rotatable through about 150°. The chamber is pumped by a cryopump and a turbomolecular pump combination so as to enable experiments with a variety of gases under different conditions. The light detection includes both a direct beam monitor and polarization analyzer. The electron detection is accomplished with either a continuous channel electron multiplier or with multichannel arrays used as area detectors.

57578 **(DESY-L-Trans—276) Shower hodoscope detector calibration by $\pi 0$ (eta°) -> 2γ decay mode.** Akimenko, S.A.; Bannikov, A.V.; Belousov, V.I.; Blik, A.M.; Kolosov, N.; Kutin, V.M.; Krumshtein, Z.V.; Pavloniv, A.I.; Solovev, A.S. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. Translation source information not available . 13p. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.).

Translated from Russian.

The description of a shower hodoscope detector of 49 blocks of TF-5 lead glass will be given and there will be determined the energy scale for the amplitude spectra of its components. The method of detector calibration using π^0 (eta°) -> 2γ decay mode will be presented.

57579 **Recent activities of the CABRI hodoscope.** Helmick, H.H. (Los Alamos National Laboratory, NM (USA)); Baumung, K.; Boehnel, K. (Kernforschungzentrum, Karlsruhe (Germany, FR)). pp 543-551 of Actes de la conference de Lyon. Vol. 4 (Proceedings of the LMFBR safety topical meeting. Vol. 4). Paris, France; SFEN (1982). (CONF-820704—).

From International topical meeting on LMFBR safety; Lyon, France (18 Jul 1982).

The present status of the CABRI hodoscope capability and how it serves as a diagnostic aid in the CABRI Fast Reactor Safety Research Project at Cadarache, France, is reported. A brief description of the 51-channel-high by 3-channel-wide neutron hodoscope is given and data reduction methods are described. Calibration requirements and counting system deadtime measurement techniques are discussed. Examples are given showing the results of single fuel pin experiments where fuel pin failure occurred and subsequent fuel motion is observed. Computer-generated graphic displays show the evolution of fuel motion in time in both two- and three-dimensional perspective illustrations. Results from several experiments are presented.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

57580 **(BNL—33694) Application of silicon carbide to synchrotron-radiation mirrors.** Takacs, P.Z.; Hursman, T.L.; Williams, J.T. (Brookhaven National Lab., Upton, NY (USA); TRW Space and Technology Group, Redondo Beach, CA (USA). Applied Technology Div.). Sep 1983. Contract AC02-76CH00016. 40p. (CONF-830910—3). NTIS, PC A03/MF A01. Order Number DE84001461.

From 3. national conference on synchrotron radiation instrumentation; Upton, NY, USA (12 Sep 1983).

Damage to conventional mirror materials exposed to the harsh synchrotron radiation (SR) environment has prompted the SR user community to search for more suitable materials. Next-generation insertion devices, with their attendant flux increases, will make the problem of mirror design even more difficult. A parallel effort in searching for better materials has been underway within the laser community for several years. The technology for dealing with high thermal loads is highly developed among laser manufacturers. Performance requirements for laser heat exchangers are remarkably similar to SR mirror requirements. We report on the application of laser heat exchanger technology to the solution of typical SR mirror design problems. The superior performance of silicon carbide for laser applications is illustrated by various material trades studies, and its superior performance for SR applications is illustrated by means of model calculations.

4403 Miscellaneous Instruments

REFER ALSO TO CITATION(S) 56867, 56869, 57138, 57364

57581 (INIS-mf—8473, pp vp) **Rugged on-line heavy water monitor designed for plant conditions.** Lynch, G.F.; Allen, V.H. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.:. [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Extensive operating experience with the present on-line heavy water monitors has identified specific design features that restrict their applicability or add considerably to capital and operating costs. To overcome these fundamental limitations the basic instrument has been re-engineered. While still retaining the accuracy and resolution of the existing instruments, the new design is more tolerant of operating and environmental parameters and requires no special station services, thus reducing the overall monitoring costs.

57582 **(LA-UR—83-2290) VISAR: 2 1/2 minutes for data reduction.** Hemsing, W.F. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830874—27). NTIS, PC A02/MF A01. Order Number DE83017605.

From 27. annual international technical symposium on high speed photography, videography and photonics; San Diego, CA, USA (21 Aug 1983).

Starting with a pair of signals obtained by electronically subtracting photodetector outputs from any VISAR, it is possible to plot velocity vs time, velocity vs distance, and distance vs time in 2 1/2 min using an LSI-11/23 computer. This includes time for six iterations of time shift with the resulting polar plots and operator interactions. The velocity calculating algorithm and a flow chart of the computer program are presented.

57583 **(LBL—16106) Aethalometer - an instrument for the real-time measurement of optical absorption by aerosol particles.** Hansen, A.D.A.; Rosen, H.; Novakov, T. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 9p. (CONF-8309166—1). NTIS, PC A02/MF A01. Order Number DE84000400.

From 2. international conference on carbonaceous particles in the atmosphere; Linz, Austria (11 Sep 1983).

We describe an instrument that measures the concentration of optically absorbing aerosol particles in real time. This absorption is normally due to black carbon, which is a good tracer for combustion emission. The minimum resolving times range from seconds in urban environments to minutes in remote locations. We present results obtained during operation on an aircraft. Due to the time resolution capability, we can determine the spatial distributions of absorbing aerosol. From the Greek word for to blacken with soot, we have named this instrument the aethalometer.

57584 **(SAND—83-2109C) Use of numerical heat-transfer techniques to analyze thermal-comparator conductivity measurements.** Sweet, J.N.; Moss, M.; Sisson, C.E. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 39p. (CONF-8310163—3). NTIS, PC A03/MF A01. Order Number DE84000945.

From 18. international thermal conductivity conference; Rapid City, SD, USA (3 Oct 1983).

The thermal conductivity of solid samples with conductivities in the range $\approx$ .2 to 50 W/m-K, is frequently measured by the comparative or cut-bar method. In this technique, the specimen under test is sandwiched between two similarly sized reference materials of known conductivity which act as heat flux gages. An axial heat flow is established by means of heaters at the top and bottom of the reference-sample-reference stack. The thermal conductivity of the sample is then calculated from the measured temperature gradients across the references and the sample, with the implicit assumption that the axial heat flux is uniform throughout the stack. We have made a detailed numerical heat transfer analysis of the commercially available Dynatech TCFM comparator with the aid of a finite difference numerical heat transfer code (SINDA). The goal of this study has been to determine the effect of non-uniform axial heat flux on the measured conductivity and to define the magnitude of the errors likely to be observed in various experimental situations. Several situations of experimental interest have been analyzed in detail in order to facilitate the determination of accurate conductivity information from raw experimental data. Correction factors are given for correcting the measured conductivities of samples with true conductivities in the range $\approx$ 0.05 to 1 W/m-K when measured against Pyrex or Pyroceram. Estimated errors are given for measurements with various combinations of Pyrex and Pyroceram references and samples. Results are also given to show the utility of numerical calculations in situations where the sample diameter is significantly less than the reference diameter. Various approximate methods of correcting for nonuniform heat flow are compared to the numerical predictions for selected cases.

57585 **Design considerations for an X-ray microprobe.** Howells, M.R.; Hastings, J.B. (Brookhaven National Lab., Upton, NY (USA). National Synchrotron Light Source). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 379-386(15 Apr 1983). (CONF-820839—).

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

The optical design of a fluorescent microprobe covering the X-ray region from 2 to 16 keV is considered for the NSLS X-ray ring. The limit on detectability is from total (photons/μm^2) and several design choices are considered to match the optical system to the storage ring to maximize throughput. The tradeoffs in image quality and energy resolution of these designs have been considered and within these constraints two firm proposals are presented.

57586 **X-ray beam line at the NSLS for X-ray absorption studies in material science.** Sayers, D.E. (North Carolina State Univ., Raleigh (USA)); Heald, S.M.; Pick, M.A. (Brookhaven National Lab., Upton, NY (USA)); Budnick, J.J. (Connecticut Univ., Storrs (USA)); Stern, E.A. (Washington Univ., Seattle (USA)); Wong, J. (General Electric Co., Schenectady, NY (USA). Research and Development Center). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 631-635(15 Apr 1983). (CONF-820839—). Contract AS05-80ER10742.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

The development of the Material Science EXAFS line which covers the energy range of 4 keV to >25 keV is described. The general design parameters of the line have been developed specifically for the application of X-ray absorption spectroscopy to problems in material science. The optics systems consisting of a vertically collimating SiC mirror and a unique four crystal monochromator are described along with results of extensive ray tracing studies. The two back-end configurations to be used on this line will also be discussed.

57587 **Layered synthetic microstructures: measurements and applications.** Day, R.; Grosso, J.; Bartlett, R. (Los Alamos National Lab., NM (USA)); Barbee, T. (Stanford Univ., Palo Alto, CA (USA)). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 245-249(15 Apr 1983). (CONF-820839—).

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

Advances in thin film fabrication techniques have made metal multilayer diffracting optics an important new technology. In this paper we present the results of characterization measurements on a variety of state-of-the-art metal multilayer samples and we describe their possible use in several monochromator applications.

57588 **Design of doubly focusing, tunable (5-30 keV), wide bandpass optics made from layered synthetic microstructures.** Bilderback, D.H.; Lairson, B.M. (Cornell Univ., Ithaca, NY (USA). Cornell High Energy Synchrotron Source; Cornell Univ., Ithaca, NY (USA). School of Applied and Engineering Physics); Barbee, T.W. Jr. (Stanford Univ., CA (USA). Dept. of Materials Science and Engineering); Ice, G.E.; Sparks, C.J. Jr. (Oak Ridge National Lab., TN (USA). Metals and Ceramics Div.). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 251-261(15 Apr 1983). (CONF-820839—). Contract W-7405-ENG-26.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

Layered Synthetic Microstructures (LSMs) show great promise as focusing, high-throughput, hard X-ray monochromators. Experimental reflectivity vs. energy curves have been obtained on carbon-tungsten and carbon-molybdenum LSMs of up to 260 layers in thickness. Reflectivities for three flat LSMs with different bandpasses were 70% with $\Delta E/E=5.4\%$, 66% with $\Delta E/E=1.4\%$, and 19% with $\Delta E/E=0.6\%$. A new generation of variable bandwidth optics using two successive LSMs is proposed. The first element will be an LSM deposited on a substrate that can be water cooled as it intercepts direct radiation from a storage ring. It can be bent for vertical focusing. The bandpass can be adjusted by choosing interchangeable first elements from an assortment of LSMs with different bandpasses (for example, $\Delta E/E=0.005$, 0.01, 0.02, 0.05, 0.1). The second LSM will consist of a multilayered structure with a 10% bandpass built onto a flexible substrate that can be bent for sagittal focusing. The result will be double focusing optics with an adjustable energy bandpass that are tunable from 5 to 30 keV.

57589 **UHV compatible two-crystal monochromator for synchrotron radiation.** Cowan, P.L.; Jach, T. (National Bureau of Standards, Washington, DC (USA). Quantum Metrology Section); Hastings, J.B. (Brookhaven National Lab., Upton, NY (USA). Physics Dept.); Kirkland, J.P. (Sachs/Freeman Associates, Inc., Bowie, MD (USA); Naval Research Lab., Washington, DC (USA). Condensed Matter Physics Branch). *Nuclear Instruments and Methods in Physics Research;* **208**: No. 1-3, 349-353(15 Apr 1983). (CONF-820839—). Contract AC02-76CH00016.

From International conference on X-ray and VUV synchrotron radiation instrumentation; Hamburg, F.R. Germany (9 Aug 1982).

For obvious reasons, monochromatic synchrotron radiation studies at soft X-ray energies require that the monochromator be ultra-high vacuum compatible. We will describe the design, testing and performance of a linkage based, two-crystal, non-dispersive monochromator for use at synchrotrons. The use of a mechanical linkage reduces the degrees of freedom and minimized the number

of motion feedthroughs into the vacuum. The linkage chosen maintains a constant output beam position, and assures that the second crystal is always properly positioned. Pertinent design features include direct angular encoding and a feedback-controlled correction system to eliminate the effects of mechanical imperfections.

4404 Well Logging Instrumentation

REFER ALSO TO CITATION(S) 56932, 56933

45 EXPLOSIONS AND EXPLOSIVES

57590 (UCRL—88760) Simulation of shock-induced energy flux in molecular solids. Karo, A.M.; Walker, F.E.; DeBoni, T.M.; Hardy, J.R. (Lawrence Livermore National Lab., CA (USA); Nebraska Univ., Lincoln (USA). Behlen Lab. of Physics). 29 Sep 1983. Contract W-7405-ENG-48. 16p. (CONF-830704—9). NTIS, PC A02/MF A01. Order Number DE84001157.

From 9. international colloquium on dynamics of explosions and reactive systems; Poitier, France (3 Jul 1983).

Computer molecular dynamics has been used to study the time evolution of the energy of diatomic molecules embedded in a monatomic host lattice when the system is shock loaded. Center-of-mass, rotational, and internal energies were each monitored. For H_2 and CH groups in an iron host, the results demonstrate rapid and violent internal excitation of a totally athermal nature. The origins of this are discussed as are the reasons for the absence of a similar effect for a CH group in a carbon lattice. From these results for diatomic systems it is argued that large molecules, similarly treated, may easily be excited to the point of rupture. If they are so situated (e.g., at or near a surface) that during, or shortly after, excitation they escape from the lattice, they will rupture rather than de-excite and thus generate molecular fragments (e.g., free radicals) which could, in the case of explosive system, serve to initiate detonation.

4501 Chemical

57591 (INIS-BR—22) System for the non-destructive detection of faults in safety fuses using radioisotopes. Goncalves, D. (Companhia Energetica de Sao Paulo (Brazil)). 1980. 25p. (In Portuguese). (CONF-8012109—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83781094.

From 1. nuclear instrumentation symposium; Rio de Janeiro, Brazil (9 Dec 1980).

Design of equipment for on line detection of faults in the safety fuses for conventional explosives employing transmission of β-radiation is reported. The faults are detected by an ion-chamber based on the variation of the intensity of the beta particles transmitted through the fuse during its passage across the collimated beam: Strontium-90 encapsulated in stainless steel or aluminum is used as the β-source. An electrical signal corresponding to the fault is obtained by subtraction of an external current, that is equivalent to the output of the ion-chamber in the presence of faultless fuse.

57592 (UCRL—89188-Rev.1) Bound and free moisture in explosives and plastics. Ward, R.L.; Pyper, J.W.; Felver, T.; Althouse, L.P. (Lawrence Livermore National Lab., CA (USA); Sandia National Labs., Livermore, CA (USA)). 1983. Contract W-7405-ENG-48. 17p. (CONF-8310111—4-Rev.1). NTIS, PC A02/MF A01. Order Number DE84001402.

From 11. DOE annual compatibility meeting; Livermore, CA, USA (18 Oct 1983).

The prediction of the amount of moisture that can become free inside a nuclear weapon during its stockpile lifetime is an important compatibility issue. This free moisture can promote the corrosion of critical parts or production of hydrogen which is deleterious to system electronics. We have embarked on a program to develop the best method of measuring free and bound moisture in organic solids. A review of the recent literature on moisture analysis yielded a complete structural classification scheme for water in solids. Proton NMR of TATB and its plastic bonded derivatives reveals a Pake doublet spectrum with a superimposed mobile water peak. Mobile water concentrations without the use of standards can be measured to about 0.25%. The measurement of lower concentrations of water is difficult because of integration and signal-to-noise problems. The use of standards allows measurement of water to about 0.02%. We have not been able to separate out rigidly bound water, if it is present, from TATB protons. In an evaluation of dielectric spectroscopy of TATB, we were unable to detect any H_2O dispersion peaks in the temperature range -120 to 23°C at frequencies of 1 and 100 kHz. This method is apparently not sensitive enough to use in this case.

4502 Nuclear

REFER ALSO TO CITATION(S) 56994

50 ENVIRONMENTAL SCIENCES, ATMOSPHERIC

5001 Basic Studies

57593 (DOE/NV/10162—11) Development of design hyetographs for southern Nevada. French, R.H. (Nevada Univ., Reno (USA). Water Resources Center). Jun 1983. Contract AC08-81NV10162. 48p. NTIS, PC A03/MF A01. Order Number DE84001227.

Portions are illegible in microfiche products. Original copy available until stock is exhausted.

Traditionally, drainage facilities are designed from an estimate of the peak flood discharge of a specified return period which is expected to occur in a channel. In small watersheds, particularly those located in the semi-arid and sparsely populated Southwest, measured flood discharge data are often unavailable, not dependable, or the period of record is very short. In many areas of the Southwest, there are often relatively long and accurate records of precipitation in areas where there are few flow records. In such areas and for small drainages the use of a design hyetograph and a simple watershed model may provide the information required regarding the peak discharge for the design of drainage facilities. The primary goal in this report was to evaluate the historical precipitation records at Well 5B and Cane Spring on the Nevada Test Site and at McCarran International Airport in Las Vegas, Nevada from the viewpoint of developing a generalized, triangular design hyetograph hypothesis for the Southern Nevada area.

57594 (DP—1650) SRL tethersonde and echosonde data, Anderson Creek Valley, California. Schubert, J.F. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). Sep 1983. Contract AC09-76SR00001. 18p. NTIS, PC A02/MF A01. Order Number DE84001680.

This data report on nocturnal drainage winds in Anderson Creek Valley of northern California documents the efforts of the Savannah River Laboratory (SRL), in a multilaboratory study sponsored by the Department of Energy. This study was undertaken during September 1980 to quantify the physical parameters of nocturnal drainage winds in complex terrain. We obtained the data listings in this report from a tethersonde and a doppler acoustic echosonde located at Rancho Tranquillo, UTM Coordinates, North 4292.2, East 526.1, elevation 526 meters.

57595 (DP-MS—83-92) Modeling nonhomogeneous, nonstationary urban boundary layers: treatment of ground-air and water-air exchange. Garrett, A.J. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 1983. Contract AC09-76SR00001. 92p. NTIS, PC A05/MF A01. Order Number DE84001623.

The crucial question for mesoscale modelers of urban areas is: can the various albedos, conductivities, roughnesses, and permeabilities of different urban surfaces be combined in some fashion that will produce good estimates of urban surface layer fluxes over the wide range of meteorological conditions experienced by tropical and middle latitude cities. Will these combinations also generate the correct profiles of winds and turbulence which are needed in trans-

port and diffusion models. These questions probably cannot be answered at present. Dense measurements in urban areas of mean surface and atmospheric variables, turbulence, and fluxes are needed. Numerical models can correctly predict the effects of spatially homogeneous surface variables on atmospheric structure, but the degree of success of simulations of the heterogeneous case will depend on the ability of the atmosphere to horizontally diffuse atmospheric properties from the microscale to the mesoscale. Thus progress in mesoscale modeling of atmospheric structure over urban areas will depend to some degree on progress in understanding of horizontal turbulent diffusion in the planetary boundary layer. 93 references, 19 figures.

57596 (N—8322846) **Acid precipitation and the use of fossil fuels.** (Committee on Energy and Natural Resources (U.S. Senate), Washington, DC). 1982. 1546p. (GPO—98-172). Avail: Committee on Energy and Natural Resources.

GPO Hearings before the Comm. on Energy and Natural Resources, 97th Congr., 2d Sess., 10 Aug. 1982.

Acid precipitation and fossil fuel use in our national energy economy are reviewed.

57597 **Composition measurements of stratospheric ions.** Arnold, F. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany, F.R.)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Recent progress in the field on in-situ ion composition measurements in the earth's atmosphere is reviewed with particular emphasis on stratospheric measurements. During recent years it became possible to measure the composition of stratospheric positive and negative ions over an extended altitude range (15-42 km) using balloon-borne ion mass spectrometers. It turned out that these measurements provide important information not only on ions but also on neutral trace gases and aerosols.

57598 **Morphology and physiology of facultative autotrophic coryneformic bacteria with ability of carbon monoxide oxidation.** Jochens, G. Kiel, Germany, F.R.; Kiel University, Mathematisch-Naturwissenschaftliche Fakultaet (1979). 109p. (In German). Available from the library of Kiel Univ. (Germany, F.R.).

Two coryneform bacterial strains (IFAM 1131 and IFAM 1133) capable of living on CO as the sole energy and carbon source were selected from a number of co-tolerant bacteria and studied more closely. Both strains could provisionally be grouped in the genera Arthrobacter. Their ability for heterotrophic growth with a variety of C-sources and also autotrophic growth under CO and H_2 atmospheric conditions characterised the test strains as facultative autotrophs. They could clearly be distinguished from all other CO- and H_2-autotrophic bacterial strains described in the literature. Studies on strain IFAM 1131 using ^{14}CO shared that for CO-autotrophic growth, carbon monoxide is oxidised to CO_2. Ribulose 1,5-bisphosphate carboxylase activity, only found in autotrophically - grown cells, provided evidence for CO_2 as the C-source and its fixation via the calvin cycle. The CO-oxidising system was also active in the absence of CO_2. Gas chromatographically determined conversion rates for CO-autotrophically-grown static cultures of the strain IFAM 1131 revealed that some 20% of the CO oxidised to CO_2 was fixed during logarithmic growth.

5002 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 56881, 56882, 56883, 56884, 56886, 56887, 56891, 56915, 57253, 57606

57599 **(BNL—33585) Gaseous-tracer technology and applications.** Dietz, R.N.; Dabberdt, W.F. (Brookhaven National Lab., Upton, NY (USA); SRI International, Menlo Park, CA (USA). Atmospheric Science Center). Jul 1983. Contract AC02-76CH00016. 88p. (CONF-8308128—1). NTIS, PC A05/MF A01. Order Number DE84000857.

From American Meteorological Society short course on instruments and techniques for probing the atmospheric boundary layer; Boulder, CO, USA (8 Aug 1983).

Gaseous-tracer techniques have been greatly improved over the past decade and currently are being used in applications that range over length scales from a few meters to a thousand kilometers and more. Tracers currently in use include sulfur hexafluoride, chlorofluorocarbons, and perfluorocarbons. Sampling and detection systems are reviewed for the various tracers, as are sampling techniques and strategies. Primary emphasis is on in situ measurement techniques although remote detection methods are also surveyed. Applications of tracers that are reviewed include diffusion measurements, medium and long-range transport, source-strength estimation, and infiltration. Special emphasis is given to analysis methods for determination of diffusion parameters.

57600 **(CONF-830918—3) Trace metals in rain at forested sites in the eastern United States.** Lindberg, S.E.; Turner, R.R. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 9p. NTIS, PC A02/MF A01. Order Number DE84000720.

From CEP international conference on heavy metals in the environment; Heidelberg, F.R. Germany (6 Sep 1983).

Precipitation was collected intermittently between 1975 and 1982 as wetfall-only at four forested sites in the southeastern United States and analyzed for Cd, Mn, Pb, and Zn. Mean concentrations at these rural sites were low, ranging from ~ 0.2 (Cd) to 4 (Mn) to ~ 7 (Pb and Zn) μg/L. Significant temporal and spatial trends were observed: all metal concentrations were higher during warm weather periods than during winter; concentrations of Cd and Pb decreased from 1976 to 1977 to 1980 to 1982; and for this later period Cd and Pb also exhibited significant differences in concentration among sites. Manganese, which is primarily soil derived, exhibited no significant trends. Metal concentrations in rain are negatively correlated with rainfall amount, indicating a dilution effect. We estimate that in-cloud aerosol scavenging dominates the long-term total wet desposition of these elements, but it is more important for Pb than for Cd and Mn.

57601 **(KFK-AFR—006) Elementary analysis of airborne dust (preliminary findings of the AFR Coordinated Airborne Dust Programme (LVPr)).** (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Arbeitsgemeinschaft zur Foerderung der Radionuklidtechnik). Mar 1983. 302p. (In German). NTIS (US Sales Only), PC A14/MF A01. Order Number DE83751274.

In March 1981 the systematic measuring of 15 elements of airborne dust was started in the Coordinated Airborne Dust Program (LVPr) by the Association for the Promotion of Radionuclide Technology (AFR). The sampling was done under comparable conditions at five selected places within the Federal Republic of Germany by using especially developed large-filter High Volume Samplers. The aim of this research is to establish the foundation for further investigations on the effects of the current given element concentrations on human life. When the results of the first half-year (summer period) were in hand, these element concentrations, which had been analysed using different methods, were presented to a group of experts, also with the experience gained with the analytical methods, in order to critically assess procedure and philosophy of this study. This evaluation was done on the occasion of a colloquium on Jun 29th, 1982 at the Karlsruhe Nuclear Research Centre. The presented AFR-Report contains the papers and the discussions of this meeting as well as the average element data with respect to the sampling time between 15th and 40th week of the year 1981.

The discussion contributions presented here correspond to the essential statements that have been given and recorded. A total classification of all data relating to the whole sampling time of the LVPr will be given in AFR-Report No. 007.

57602 **Silicon negative ion chemistry in the atmosphere - in situ and laboratory measurements.** Viggiano, A.A.; Arnold, F. (Max-Planck-Institut fuer Kernphysik, Heidelberg (Germany, F.R.)); Fahey, D.W.; Fehsenfeld, F.C.; Ferguson, E.E. (Environmental Science Services Administration, Boulder, CO (USA). Aeronomy Lab.). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The results of rocket-borne mass spectrometer indicate large concentrations of negative ions above the bottom of the atmospheric atomic oxygen layer. A large majority of these ions has masses greater than 100amu. In addition, an ion at mass 76 was observed with concentration too large to be CO^-_4. In order to explain these features, a number of reactions involving silicon oxide negative ions has been measured in a flowing afterglow system. The SiO^-_3 is produced by reaction of O^-_3 and CO^-_3 with SiO. The SiO^-_3 p scuion is extremely stable and does not react measurably with NO, NO_2, CO, CO_2, O_3 or O. Since meteroid ablation produces a large silicon input into the atmosphere, it appears possible that the ions observed at mass 76 may be SiO^-_3. Possible production mechanisms for this ion as well as the heavy ions are discussed.

57603 **Unresolved problems in SO/sub x/, NO/sub x/, soot control in combustion.** Levy, A. (Battelle Columbus Labs., Ohio). *Symposium (International) on Combustion, [Proceedings]*; 1223-1242(1982). (CONF-820801—).

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

This paper attempts to keynote where we are today and what are the principal unanswered questions in the three key areas of SO/sub x/, NO/sub x/, and soot control in combustion. Combustion-pollution technology is probably on its firmest grounds in the area of SO/sub x/ on slightly less firm ground in the area of NO/sub x/ control, and has farthest to go in soot control. Major attention in SO/sub x/ technology is directed to fuel-rich combustion and the application of SO/sub x/ kinetics to staged combustion, interaction of SO/sub x/ with NO/sub x/ control mechanisms, and a renewed interest in limestone capture of sulfur. Principal concerns of NO/sub x/ control address issues of fuel nitrogen release, the nature of fuel nitrogen species, interactions of nitrogen-containing species in fuel-rich combustion, radical overshoot in rich flames, and the conversion of NO to NO_2 in gas turbines and gas burners. Problem areas in soot control are brought forth by consideration of six principal areas which make up a general mechanism for soot formation. Also addressed in the soot discussions are the role of additives, the relation of polycyclic aromatic hydrocarbon formation to soot, and the generation of soot in diesel combustion. 128 references.

5003 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 56984, 56989, 57437, 57601

57604 **(DOE/ER/60005—T1) Residential radon monitoring. Progress report, March 1, 1982-September 1, 1983.** (Pittsburgh Univ., PA (USA)). 1983. Contract AC02-81ER60005. 5p. NTIS, PC A02/MF A01. Order Number DE84001271.

Progress is reported on research in radon monitoring in homes in the Pittsburgh, Pennsylvania, area, studies of radon emanation from suits in the Pittsburgh area, and studies on radon levels in public and commercial buildings. (ACR)

57605 **(INIS-mf—8545) Environmental aspects: - Atmospheric, - aquatic, - terrestrial dispersion of radionuclides.** Kirchmann, R. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Schule fuer Kerntechnik). 1982. 34p. (CONF-8209134—23). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703585.

From IAEA interregional training course on waste management in nuclear facilities; Karlsruhe, F.R. Germany (6 Sep 1982).

After general introductory remarks the paper deals with the dispersion of radionuclides in the atmosphere and in the aquatic environment as well as with the transfer through the terrestrial environment.

57606 **(KFK—3456) Experimental determination of the atmospheric dispersion at the Karlsruhe Nuclear Research Center for 160 m and 195 m emission heights. Pt. 1.** Thomas, P.; Huebschmann, W.; Schuettelkopf, H.; Vogt, S. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit; Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekt Nukleare Sicherheit). Mar 1983. 174p. NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751262.

Diffusion experiments have been carried out at the Karlsruhe Nuclear Research Center in order to investigate the atmospheric diffusion of pollutants and to determine specifically the influence on atmospheric diffusion of topographic conditions specific to the site. For this purpose, halogenated hydrocarbons are emitted at 160 m and 195 m height, their local concentration distribution is measured at ground level downwind of the source. Part 1 of the report describes the diffusion experiments performed and presents the detailed data of measurements. These include the coordinates of the sampling positions, the measured concentrations and the relevant meteorological data recorded during the experiments. The stability classes prevailing during the experiments are derived from these data and are indicated.

57607 **(KFK—3480) Simple method to determine Tr concentrations in the moisture of the exhaust air of nuclear facilities and in the ambient air.** Weber, H.W.; Schuettelkopf, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Apr 1983. 51p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751165.

In the course of nuclear power plant operation radioactive tritium is generated which is released to the environment as HTO via the exhaust air and the liquid effluents. Measurement and balancing of the tritium emissions are required in order to be able to evaluate the resulting radiation exposure of the population. For determination of the HTO emission the humidity of the measured air is absorbed at a rod shaped molecular sieve of 1/16" mesh size. The desiccant is contacted with T-free water and the T activity concentration of the water is determined after $^3H/^1H$ isotope exchange. The rod shaped molecular sieves are suited for use under this method on account of their drying capacity largely independent of temperature and air humidity and the good handling capability. The detection limit is at 19 Bq HTO/m^3 air. The exhaust air from several ^3H-emitters of the Karlsruhe Nuclear Research Center was monitored by this method for its HTO content and the results were compared with the values measured at existing points of measurement. The good results have been the reason for the application of such collectors in the routine T-measurement performed within the framework of exhaust air monitoring on the site of the Karlsruhe Nuclear Research Center.

5004 Thermal Effluents Monitoring And Transport

REFER ALSO TO CITATION(S) 57655

5006 Regulations

REFER ALSO TO CITATION(S) 57233

51 ENVIRONMENTAL SCIENCES, TERRESTRIAL

5101 Basic Studies

REFER ALSO TO CITATION(S) 56864, 56980, 56981, 56982, 56983

57608 **(DOE/EV/00641—51) Regulation of ecosystem processes by arthropod communities.** Seastedt, T.R.; Crossley, D.A. Jr. (Georgia Univ., Athens (USA). Dept. of Entomology). 1 Sep 1983. Contract AS09-76EV00641. 26p. NTIS, PC A03/MF A01. Order Number DE84001774.

Arthropods or their activities regulate the amounts of forms of mass and nutrients in terrestrial ecosystems. Canopy arthropods have the largest impacts on mobile elements such as potassium, while soil detritivores control mineralization rates of less mobile elements such as nitrogen, phosphorus and calcium. Nominal (baseline) herbivory and detritivory combine to speed nutrient cycling and reduce standing crops of decaying plant materials. 42 references, 1 figure, 3 tables.

57609 **(INIS-BR—30) Application of fluorescent-and radioactive tracers in Sedimentology.** de Alencar, L.M.L. (Minas Gerais Univ., Belo Horizonte (Brazil). Escola de Engenharia). 1981. 159p. (In Portuguese). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83781132.

The development of techniques of sediment labelling, creating the possibility of using fluorescent and radioactive tracers not yet applied in Brazil, in the area of sedimentology, is studied.

57610 **(N—8322690) The effects of a tropical rain forest cover on airborne gamma ray spectrometry.** Pereira, E.B.; Nordemann, D.J.R. (Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil)). Mar 1983. 36p. (INPE—2665-PRE/275). NTIS, PC A03/MF A01.

A simple experiment is made to demonstrate the strong influence of the forest biomass on the soil gamma photons measured at low altitudes. Next, theoretical calculations are made to estimate the effects of attenuation and generation of gamma photons by a tropical rain forest environment. For typical flight altitudes of 100 meters, it is shown that a 35 meter high canopy can attenuate from 40% to 60% of the original gamma photons, depending on the energy considered. It is also shown that the 1.46 MeV photopeak of 40-K measured at flight altitudes is completely dominated by the forest generated component, while this effect is probably negligible for the 2.62 MeV of 108-Tl and the 1.76 MeV of 214-Bi. Of major importance are the effects of forest clearings on the gamma-ray spectrum, which can lead to serious misinterpretations of aerial profile data if not taken into account. Besides the theoretical evaluation of these and other effects from the viewpoint of applied airborne gamma-ray spectrometry, a short review on the biocycles of potassium from the soil to the biomass of the tropical rain forest is also presented.

57611 **Energetic consequences of sexual size dimorphism in nestling red-winged blackbirds.** Fiala, K.L..; Congdon, J.D. (Univ. of Michigan, Ann Arbor). *Ecology;* **64**: No. 4, 642-647(1983). Contract AC09-76SR00819.

The energy budget of nestling Red-winged Blackbirds (Agelaius phoeniceus) was determined using doubly labeled water ($^3HH^{18}O$) to measure field metabolic rate (FMR) and body component data to measure growth energy. Sex-specific measurements permitted the evaluation of the effects of this species' substantial sexual size dimorphism on FMR and total energetics. FMR averaged CO_2 release of 5.12 $mL.g^{-1}.h^{-1}$, or 0.129 $kJ.g^{-1}.h^{-1}$, with no significant differences between the sexes. Daytime FMRs of CO_2 production (5.34 $mL.g^{-1}.h^{-1}$) were higher, but not significantly so, than nighttime FMRs (4.45 $mL.g^{-1}.h^{-1}$). Water influx averaged 0.95 $mL.g^{-1}.d^{-1}$, with daytime rates (1.22 $mL.g^{-1}.d^{-1}$) significantly higher than nighttime (0.40 $mL.g^{-1}d^{-1}$) rates. Total assimilated energy from hatching to fledging was 1014 and 797 kJ for male and female nestlings, respectively. The sexual differences in total energetics reflected differences in body size of the nestlings and suggest that there is a greater cost to the parents in raising males than in raising females.

57612 **Density estimation of small-mammal populations using a trapping web and distance sampling methods.** Anderson, D.R. (Utah State Univ., Logan); Burnham, K.P.; White, G.C.; Otis, D.L. *Ecology;* **64**: No. 4, 674-680(1983). Contract W-7405-ENG-36.

Distance sampling methodology is adapted to enable animal density (number per unit of area) to be estimated from capture-recapture and removal data. A trapping web design provides the link between capture data and distance sampling theory. It is possible to check qualitatively the critical assumption on which the web design and the estimator are based. This is a conceptual paper outlining a new methodology, not a definitive investigation of the best specific way to implement this method. Several alternative sampling and analysis methods are possible within the general framework of distance sampling theory; a few alternatives are discussed and an example is given.

57613 **Comparative census procedures using single mark-recapture methods.** Skalski, J.R. (Pacific Northwest Lab., Richland, WA); Robson, D.S.; Simmons, M.A. *Ecology;* **64**: No. 4, 752-760(1983). Contract AC06-76RL01830.

Proportional abundance is defined as the ratio of the animal abundance of one population (N_2) to that of another (N_1), say $K = N_2/N_1$. Confidence interval estimators of K for paired populations are presented using single mark-recapture studies. Two alternative estimators of K based on assumptions about catchability are constructed, and power curves developed using computer simulations. Tests of homogeneity are presented which test the assumption of each equal catchability among animals of the two populations. When the homogeneity assumption is valid, the proportional abundance estimator based on two indices of relative abundance is from 2 to 20 times more efficient than the comparable estimator based on absolute abundance. Analytic approximations for power calculations and sampling precision are presented which may be used in the design of comparative census studies.

57614 **12,000-year record of forest history from Cahaba Pond, St. Clair County, Alabama.** Delcourt, H.R. (Univ. of Tennessee, Knoxville); Delcourt, P.A.; Spiker, E.C. *Ecology;* **64**: No. 4, 874-887(1983). Contract W-7405-ENG-26.

A 650-cm sediment sequence from Cahaba Pond, St. Clair County, Alabama, spans the past 12,000 y and has yielded a pollen and plant-macrofossil record indicating major changes in forest composition during the Holocene interglacial. Both pollen and plant macrofossils from sediments of this 0.2-ha pond primarily reflect changes in local and extralocal forests within the surrounding watershed. Four distinct pollen assemblage zones were recognized: a Fagus-Ostrya zone from 12,000 to 10,200 BP, a Pinus-Magnolia zone from 10,200 to 10,000 BP, a Quercus-Carya zone from 10,000 to 8400 BP, and a Nyssa-Pinus zone from 8400 BP to the present. Forests of the early Holocene (12,000 to 10,000 BP) were mesic and predominantly composed of broadleaved deciduous trees, dominated by beech (Fagus grandifolia). Atlantic white cedar (Chamaecyparis thyoides), today a coastal species, extended inland to St. Clair County during the early Holocene, Eastern white pine (Pinus strobus), hemlock (Tsuga), striped maple (Acer pensylvanicum), and mountain maple (Acer spicatum), today rare or absent in Alabama, extended southward of their present ranges into central Alabama 10,000 y ago. After 10,000 BP, forests became more xeric, with oaks and hickories predominant. After 8400 BP, black gum (Nyssa sylvatica), southern pines (Diploxylon Pinus), red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), buttonbush (Cephalanthus occidentalis), and other elements of the modern flora became established locally. Water levels in the pond became

higher, and sedimentation rate diminished. An increase in effective precipitation in the late Holocene reflects in the establishment of the modern atmospheric circulation patterns.

5102 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 57253, 57666

57615 **(CONF-830918—2) Cycling and retention of hexavalent chromium in a plant-soil system.** Taylor, F.G. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE84000721.

From CEP international conference on heavy metals in the environment; Heidelberg, F.R. Germany (6 Sep 1983).

The environs of an industrial plant in east Tennessee (USA) have been exposed to hexavalent chromium (Cr^{+6}) deposition for over three decades. The behavior of this metal was investigated in a series of studies designed to determine its bioavailability through interception, retention, and incorporation, in plants by foliar and root uptake. In this contribution, condensed summaries of research from field and controlled environment studies are reviewed to determine how they pertain to transfers between ecosystem compartments and to ascertain the storage of the contaminant in a grassland ecosystem following years of continuous deposition.

57616 **(DOE/ER—0156/1) Geochemical, hydrological, and biological cycling of energy residuals. Subsurface Transport Program. Research Plan.** Wobber, F.J. (USDOE Office of Energy Research, Washington, DC. Office of Health and Environmental Research). Sep 1983. 29p. NTIS, PC A03/MF A01. Order Number DE84001054.

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The processes that control mobilization and attenuation of energy residuals in soils and geological strata, their hydrological transport to and within ground water regimes, and their bioaccumulation in biological systems require research attention. Scientific research in these areas will provide a base of knowledge from which long term or unexpected biological effects, if any, can be predicted and evaluated. This research program is designed to provide a base of fundamental scientific information so that the geochemical, hydrological, and biophysical mechanisms that contribute to the transport and long term fate of energy residuals in natural systems can be understood.

5103 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 56984, 56987, 57437, 57604, 57605, 57616, 57646, 57648, 57735

57617 **(EGG—10282-1004) Aerial radiological survey of Area 11, Nevada Test Site.** (EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group). Jun 1983. Contract AC08-83NV10282. 22p. NTIS, PC A02/MF A01. Order Number DE84000440.

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An aerial radiological survey of Area 11's Plutonium Valley was conducted at the Nevada Test Site from 18 to 30 January 1982. Contour maps representing terrestrial exposure rates and soil concentrations of transuranics, ^{238}U and ^{137}Cs are presented on an aerial photograph. Inventories of the locale's transuranic and uranium activities are also included.

57618 (GSF-R—290, pp 376-383) **Influence of substances being contained in water on the adsorption balances of radionuclides found in sands of northern Germany.** Lang, H. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In this study it is explained how the absorption balances of radionuclides of the elements J, Sr, Cs and Ce found in three sands of the surroundings of Gorleben depend on concentrations of foreign ions and the carrier beds.

57619 (GSF-R—290, pp 384-388) **Adsorption of radionuclides to crushed solid rocks coming from the ridge of Asse.** Stempel, C.V.; Batsche, H.; Klotz, D.; Oliv, F. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

Highly-concentrated salt waters occur locally in the Asse. Batch tests serving orientation purposes had showed that in highly concentrated salt water the absorption of different radionuclides to the rock material is inferior to that observed in fresh water. Due to the fact that the conditions of jointed aquifers cannot be simulated in the laboratory or if, only with a large amount of experimental equipment, and since this simulation has not been tested sufficiently, it was preferred to perform the radionuclide experiments on crushed solid rock material coming from the Asse. We investigated what distribution coefficients result for selected radionuclides in natural soil and with crushed solid rock material used in various measuring methods.

57620 (GSF-R—290, pp 395-424) **Behaviour of the radionuclides ^{125}J, ^{85}Sr, ^{134}Cs and ^{144}Ce in three typical sands of northern Germany under conditions of water-unsaturated flow.** Klotz, D.; Oliv, F. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The investigations described in this study help to explain the migration of radionuclides, being in the seepage water, in the upper soil layers. We investigated the behaviour of the radionuclides of the elements J, Sr, Cs and Ce in three types of loose rocks taken from the C-horizon of characteristic soils existing in the surroundings of Gorleben (Lower Saxony). These loose rocks are medium- and fine-grained sands. In the laboratory we performed batch and column experiments under the conditions of water-unsaturated flow. For these investigations we used an experimental rainwater, which we had prepared on the basis of the analytic mean values obtained for the rainwater of the Gorleben surroundings.

57621 **Distribution and relationship of radionuclides to streambed gravels in a small watershed.** Cerling, T.E.; Spalding, B.P. (Oak Ridge National Lab., TN). *Environmental Geology (New York);* 4: 99-116(1982). Contract W-7405-ENG-26.

In White Oak Creek watershed in eastern Tennessee, the radionuclides ^{60}Co, ^{90}Sr, and ^{137}Cs were retained by streambed gravels on different sites: ^{60}Co was associated with manganese in the hydrous oxide coatings on rocks and minerals; ^{90}Sr occurred primarily as an exchangeable cation although small amounts were held in a nonexchangeable form; and ^{137}Cs was held very selectively, presumably by illite in shale fragments composing the sediment. The distribution of radionucides on sediments was size dependent: the 0.85-3.35 mm fine-gravel fraction was higher in radionucide concentration than the sand fraction. An areal survey of radionuclide concentrations on streambed gravels from throughout the watershed, located numerous contamination sources. These radonuclide concentrations, when combined with both distribution coefficients of radionuclides between gravel and water and drainage area, were used to rank subsections of the watershed by their relative contribution to the overall contamination of the watershed. For ^{90}Sr, this ranking procedure agreed with the measured discharges of subsections of the watershed which are routinely monitored.

5105 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 56953, 56969, 56970, 56980, 56981, 56982, 56985, 57022

52 ENVIRONMENTAL SCIENCES, AQUATIC

5201 Basic Studies

REFER ALSO TO CITATION(S) 57593

57622 **Isotope techniques in hydrological studies: application to Chacabuco-Polpaico basin.** Orphanopoulus Stehr, D. Santiago, Chile; Chile university, Department de Ingenieria Civil (1982). 307p. (In Spanish). Available from Comision Chilena de Energia Nuclear, Santiago (Chile).

A hydrogeological study was carried out in a small alluvial valley, 45 kms. north of Santiago, Chile. Although the main economical activity is the agriculture, the valley only has small seasonal rivers. The irrigation water comes from a near basin through a channel of about 100 kms. and from the ground water. The study include aspects like: pumping tests evaluations, well stratigraphy, potentiometric surface fluctuation, water chemistry, stable isotopes and water balances. Isotopes, oxygen-18 and deuterium were used to identify the origin of the ground water in different sections of the valley and the importance of the infiltration. Also experiences were made to evaluate the evaporation of a small damm, using isotopes and the classical water balance methods.

57623 **Review and evaluation of microcosms for assessing effects of stress in marine ecosystems.** Adams, S.M.; Giddings, J.M. (Oak Ridge National Lab., TN). *Environment International;* 7: 409-418(1982). Contract W-7405-ENG-26.

Representative estuarine-marine microcosms were reviewed and evaluated to provide recommendations and guidance for use in assessing effects of perturbations on coastal zone ecosystems. Properly designed marine microcosms can be effective assessment tools for evaluating the effects of stresses on coastal ecosystems. Critical design considerations include scaling of important physical factors, such as turnover rate and circulation, inclusion of appropriate trophic groups, minimization of side growth, and maintenance of realistic nutrient regimes. Selection of communities or major components to be included in design of microcosms should be based on the experiment hypothesis, ecologically and economically important organisms, ability to interpret test results, difficulties involved in scaling, and sensitivity of the community to the stress being investigated. In selection of response parameters, emphasis should be placed on key ecological components, particle size distribution, and those variables that reflect aggrregate responses at the population or community level.

57624 **A note on the food of Callibaetis (Ephemeroptera:Baetidae).** Cushing, C.E. (Pacific Northwest Lab., Richland, WA); Rader, R.T. *Great Basin Naturalist;* 41: No. 4, 431-432(1982).

Callibaetis nymphs in Rattlesnake Springs, Hanford Reservation, Washington, feed almost exclusively on fine particulate organic matter (FPOM) collected from the stream bottom.

57625 **Measurements of growth and consumption of sauger (Stizostedion canadense): implication for fish energetics studies.** Minton, J.W.; McLean, R.B. (Oak Ridge National Lab., TN). *Canadian Journal of Fisheries and Aquatic Science;* 39: 1396-1403(1982). Contract W-7405-ENG-26.

The energy budget of sauger (Stizostedion canadense), in Watts Bar Reservoir, Tennessee, was studied over a 17-month period. Field determinations of consumption and laboratory determinations of metabolism were incorporated into the balanced energy equation of Winberg to predict growth in energy value of sauger in age-classes I^+ and II^+. The equation included energetic costs of specific dynamic action and the metabolic efficiency penalty of metabolizing body energy stores. Observed and predicted growth during the warm months, March through October, agreed within 2.5 to 9.6% for the I^+ and II^+ age-classes, respectively. Observed and predicted growth over the winter for the only age-class modeled, the I^+, did not agree. High food consumption during winter did not result in the amount of growth expected, suggesting that the physiological assumptions of the balanced energy equation are invalid for describing the winter energetics of sauger. We emphasize the potential error in inferring consumption from growth and metabolism.

5202 Chemicals Monitoring And Transport

REFER ALSO TO CITATION(S) 56852, 57253, 57616, 57674, 57716, 57734, 57763

57626 **(DOE/EV/10047—7) Transfer of energy and biomass over the continental slope and shelf off Washington: R/V WECOMA Cruise W8206a, 11-25 June 1982; R/V CAYUSE Cruise C8206, 9-26 June 1982. Preliminary report.** Peterson, W.K. (Washington Univ., Seattle (USA). School of Oceanography). May 1983. Contract AT06-79EV10047. 19p. NTIS, PC A02/MF A01. Order Number DE84001115.

A two-ship survey to collect information on the processes affecting the mechanisms of transfer of energy and biomass in waters over the continental shelf and slope off Washington was successfully completed in June 1982. Data were collected on currents, productivity and distribution of phytoplankton, environmental variables that affect plankton growth and production, zooplankton distribution and grazing rates, sediment and pore water characteristics, distribution of radionuclides, phytoplankton physiological characteristics, and on the chemistry, distribution and flux of organic matter in these waters. Vector-measuring current meters were deployed to monitor nearshore currents and station transects extending from near shore to off the slope were occupied to monitor spatial and temporal changes in several parameters. A drogue was deployed at a mid-shelf location and experimental work was conducted near the drogue for several days by R/V CAYUSE simultaneously with transect work by R/V WECOMA.

57627 **(DOE/EV/70024—59) Chemical and geochemical studies off the coast of Washington. Progress report, September 1982-July 1983.** Carpenter, R. (comp.). (Washington Univ., Seattle (USA). School of Oceanography). Jul 1983. Contract AT06-76EV70024. 23p. NTIS, PC A02/MF A01. Order Number DE84001167.

This report summarizes progress from September 1982 through July 1983 on a series of marine chemical and geochemical investigations involving both laboratory studies and field studies off the coast of Washington. Most field work the past few years has been on the Washington continental shelf, slope, and the submarine canyons indenting the shelf north of the Columbia River. Our aim is to provide basic data required to characterize underlying chemical and physical processes and their rates which control the distributions, concentrations, and ultimate fate of some of the potentially hazardous agents associated with fossil fuel and/or nuclear power production or transportation. Laboratory and field experiments and theories derived from them are being used iteratively to investigate: (1) vertical transfer or trace chemicals from surface seawaters to underlying waters and sediments; (2) processes which may transfer certain chemicals from sediments back into the overlying water column; (3) redox processes which besides changing valence states of certain chemicals may alter their precipitation/dissolution tendencies, their biological availability and/or toxicity; and (4) accumulation histories of potentialy hazardous chemicals in sediments during the past 100 years.

57628 (GSF-R—290, pp 255-271) **Propagation of Escherichia coli and of conservative tracers. A comparison.** Alexander, I.; Seiler, K.P. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The propagation of Escherichia coli (ATCC 11229, Gelsenkirchen) is compared with that of conservative tracers in groundwater. The experiments were performed with injection quantities of 10^7, 10^8, 10^{10} and 10^{11} of Escherichia coli. Both, bacteria and

conservative tracers pass their maximum at the same instant in the observation gauges. With injection quantities of more than 10^9, the propagation of the Escherichia coli sets in at the same time as it begins with the dyes. When the quantities range below 10^8, the propagation begins after that of conservative tracers, because coli bacteria were measured with a lower degree of detecting sensitivity than the tracers. With coli injection quantities ranging above 10^{10}, an increased filtering of these bacteria can be observed. Coli bacteria propagate more laterally than conservative tracers, however it could not be proved that this lateral propagation depends on the bacteria concentration.

57629 (INIS-mf—8473, pp vp) **Deep saline groundwater within the Canadian Shield.** Frape, S.K.; Fritz, P. (Waterloo Univ., Ontario (Canada)); Pearson, R. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Groundwaters have been sampled from depths greater than 1000 m within the Canadian Shield. The samples were obtained from boreholes in mines and from test drilling programs carried out as part of the Canadian Nuclear Fuel Waste Management Program. At the depths explored, water is found in fractures, shear zones and similar structural features. The salinity of the water is frequently very high, with total dissolved solids often exceeding 200 $g.L^{-1}$. These saline waters can be classified as Ca-Na-Cl brines. Isotopic analyses for ^2H and ^{18}O show that these fluids are not modern, local meteoric waters which dissolve salts in sedimentary, metasedimentary or metamorphic rocks. The chemical and isotopic data suggest that all saline waters analyzed to date have a similar origin. This source is not well-understood but could be highly modified Paleozoic seawater, residual metamorphic fluids, or less likely, groundwaters that have been in contact with the rocks in the Canadian Shield for millions of years. In all cases the fluids appear to have been isolated from the biosphere for geological time periods. The existence of these highly saline fluids influences the Nuclear Fuel Waste Management Program in several areas. A major concern is the corrosion resistance of the radioactive waste containers. Saline waters may also influence the buffer and backfill and vault sealing materials, the rock mass and the waste form itself, although the effects may not always be deleterious. Corrosion of underground test equipment during the geoscience research phase is also a concern.

57630 (LBL—16577) **Regeneration of tri-octyl phosphine oxide solutions used to extract phenol from water.** Bixby, J.L.; King, C.J. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 100p. NTIS, PC A05/MF A01. Order Number DE84000938.

Thesis. Submitted by J.L. Bixby.

Several potential extractant diluents were examined. Distillation was investigated for regenerating tri-octylphosphine oxide solutions loaded with phenol. Relative volatilities of phenol to the diluent were measured for the diluents isobutyl-heptyl ketone and dimethylnaphthalene, at both varying solute-to-extractant mole ratios and extractant concentrations in the solvent. A simple model based on the chemical complexation between the solute and extractant is proposed. The equilibrium constant for this reaction was determined to be roughly 5 L/gmole. Equilibrium distribution coefficients were also measured for the extraction of phenol from both pure water and coal-gasification condensate water, by a mixed TOPO solvent having acceptable regeneration capabilities. These data are consistent with the extraction mechanism model previously proposed by MacGlashan (1982). Losses of the extractant into the aqueous raffinates are also reported. Both the observed high distribution coefficients at low solute-to-extractant mole ratios, and the low relative volatilities indicate that the association between phenol and TOPO is strong. Hence, a high boiling diluent is needed for favorable regeneration via distillation. TOPO-based solvent extraction appears to be best suited for treatment of aqueous solutions having phenol concentrations on the order of 100 parts per million.

57631 (PNL-SA—11141) **Fate and effects of metals in the sea-surface microlayer.** Hardy, J.T.; Apts, C.W. (Pacific Northwest Lab., Richland, WA (USA)). May 1983. Contract AC06-76RL01830. 5p. (CONF-830918—4). NTIS, PC A02/MF A01. Order Number DE84000114.

From CEP international conference on heavy metals in the environment; Heidelberg, F.R. Germany (6 Sep 1983).

Although significant portions of the metals from atmospheric particulate matter (APM) dissolve in seawater, the long residence times of metals in the sea-surface microlayer (upper 50 μm) lead to high microlayer metals concentrations compared to the subsurface water. APM at realistic deposition levels is not toxic to neustonic flatfish eggs, but ionic metals at the same concentrations as those found in the deposited APM inhibit egg hatching and larval survival. APM deposition rates between 2 and 7 $mg/m^2/hr$ negatively impact photosynthesis of phytoneuston, but not phytoplankton. 9 references.

57632 **Effects of the water-soluble fraction of a coal-derived oil on pond microcosms.** Giddings, J.M. (Oak Ridge National Lab., TN). *Archives of Environmental Contamination and Toxicology;* **11**: 735-747(1982). Contract W-7405-ENG-26.

Two 80-L pond microcosms (laboratory model ecosystems) were treated with the water-soluble fraction of a crude coal liquefaction product and responses were monitored for nine weeks. A large portion of the dominant macrophyte community was destroyed by the treatment, as were filamentous algae and benthic diatoms. Snails emigrated from the systems, and zooplankton disappeared. Primary production and respiration declined for two weeks, remained low for two more weeks, then gradualy returned to pretreatment levels. Changes occurred in pH, alkalinity, conductivity, dissolved oxygen, dissolved organic carbon, and dissolved inorganic nitrogen. The microcosms recovered by the end of the experiment, but community composition and some chemical variables differed from the pre-treatment conditions.

57633 **Pollutant--particle associations and dynamics in coastal marine environments: a review.** Olsen, C.R.; Cutshall, N.H.; Larsen, I.L. (Oak Ridge National Lab., TN). *Marine Chemistry (Amsterdam);* **11**: 501-533(1982). Contract W-7405-ENG-26.

A wide variety of substances, including known or potential pollutants, become associated with particles in coastal marine environments. This association may result from: (1) ion exchange, precipitation, or hydrophobic interactions with the particle surface, (2) co-precipitation with iron and manganese hydrous oxide coatings, (3) complexation with organic substances bound or aggregated with particles, (4) incorporation into mineral lattices, organisms or fecal material, or (5) flocculation of colloidal organic and inorganic matter during river and sea water mixing. The transport, accumulation and fate of such chemically-reactive pollutants in coastal marine environments are governed to a great extent by particle dynamics. Understanding of the mechanisms and processes affecting pollutant--particle associations and dynamics allows the prediction of the fate of a wide variety of pollutants in estuarine, coastal and marine environments.

57634 **A brief discussion on the mean oceanic residence time of elements.** Li, Y. (Lamont-Doherty Geological Observatory of Columbia Univ., Palisades, NY). *Geochimica et Cosmochimica Acta;* **46**: 2671-2675(1982).

The mean oceanic residence times of elements obtained from deposition rates in deep-sea sediments are more representative than those obtained from river-input rates. The average concentration data of dissolved S, Au, Ag, Se, As, Hg, Sb, Zn, Sn, Cu and Pb in rivers contain large pollution and/or contamination components.

5203 Radioactive Materials Monitoring And Transport

REFER ALSO TO CITATION(S) 56863, 56979, 56984, 56986, 56989, 57437, 57605, 57616, 57620, 57628, 57668, 57689, 57763

57635 **(DPST—82-1076) Examples of Savannah River water dilution between the Savannah River Plant and the Beaufort-Jasper and Port Wentworth water-treatment plants.** Hayes, D.W. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 12 Jan 1983. Contract AC09-76SR00001. 12p. NTIS, PC A02/MF A01. Order Number DE84000644.

A substantial dilution of the river water occurs between the Savannah River Plant (SRP) and the two treatment plants. This dilution results from inflow of surface and groundwater and from direct rainfall. The amount of dilution was estimated to be approximately 20% and 54% down to the Port Wentworth and Beaufort-Jasper plants, respectively.

57636 **(DPST—83-671) Cs-137 transport in Steel Creek.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 12 Jan 1982. Contract AC09-76SR00001. 12p. NTIS, PC A02/MF A01. Order Number DE84000639.

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The initial estimate of the expected Cs-137 transport in Steel Creek following L Reactor restart as presented in the Environmental Assessment, was based on historical data. To improve these estimates of Cs-137 remobilization in the Steel Creek system, Cs-137 transport studies were made during the L-Reactor pumping tests of ambient water in February to April 1982. Based on data from measurements conducted during the L-Reactor pump tests of March 1982, the suspended sediment-water transport during the first year will be only 2.3 +- 1.8 Ci/y. Values for the other two components of the transport estimate (hot water desorption and biota loss) remain unchanged. The reassessmant will reduce the estimated ten year release from 41 to 14.4 Ci.

57637 **(DPST—83-673) Co-60 transport from Steel Creek as a result of L-Reactor restart.** Hayes, D.W.; Watts, J.R. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 9 Mar 1983. Contract AC09-76SR00001. 10p. NTIS, PC A02/MF A01. Order Number DE84000203.

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A total of 66 Ci of Co-60 have been discharged to SRP streams since startup. About 26.6 Ci of Co-60 have been released to Steel Creek from L (14.9 Ci) and P (11.7 Ci) areas. Due to radioactive decay only about 2.1 Ci of the initial 26.6 Ci of Co-60 remains today (halflife 5.26 years). If all of the released Co-60 remained in the Steel Creek system the 2.1 Ci Co-60 inventory is significantly less than the Cs-137 inventory of 67 Curies. The concentration and dose from the possible remobilization of this Co-60 is calculated. Co-60 has a strong affinity for sediments. Co-60 has been measured in the Steel-Creek system by aerial survey, and in the sediments. The aerial survey measured distribution of Co-60 is considerably less than the Cs-137 distribution. The highest Co-60 exposure rate isopleth range in the Steel Creek system is about 20% of the Cs-137 range. Co-60 activity is about one tenth the Cs-137 in the sediments of the Steel Creek system.

57638 **(DPST—83-693) Cs-137 and Co-60 concentrations in water from the Savannah River and water-treatment plants downstream of SRP.** (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 26 Jul 1983. Contract AC09-76SR00001. 13p. NTIS, PC A02/MF A01. Order Number DE84000130.

In preparation for restart of L-Reactor, a comprehensive environmental sampling and analysis program was initiated in March 1983 to determine Cs-137 concentrations in off-site water downstream from Savannah River Plant (SRP). Concentrations of Co-60 also are determined in this sampling and analysis program. This report summarizes the first three months of results. Cesium-137 concentrations are reported for finished water from the Beaufort-Jasper, Port Wentworth and North Augusta water treatment plants for weekly continuous samples during April through June 1983. The very low concentrations of cesium-137 in finished water from downstream water treatment plants showed significant changes during this time. The changes in concentration occurred smoothly and correlate with changes in river flow. No changes in concentration during April through June can be attributed to L-Reactor's only cold water test which occurred June 8 and 9. No Co-60 was observed in any samples.

57639 (GSF-R—290, pp 50-73) **Methods applied for the determination of the contents of stable isotopes.** Stichler, W.; Trimborn, P.; Auer, R.; Lowag, H.; Wahl, M. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

Measurements of stable environmental isotopes require particular preparation procedures and measuring techniques. At present the GSF Institute for Radiohydrometry applies preparation systems for determining the content of ^{2}H, ^{3}He and ^{18}O in water samples and for detecting ^{13}C and ^{18}O in organic material. The corresponding precision measurements are performed by means of various mass spectrometers.

57640 (GSF-R—290, pp 74-94) **Methods applied for measuring radioactive environmental isotopes.** Eichinger, L.; Forster, M.; Kuchler, M.; Rast, H.; Rauert, W.; Salvamoser, J.; Wolf, M. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

Hydrologic applications of the radioactive environmental isotopes ^{3}H, ^{14}C and ^{85}Kr require measuring methods, whose detection limits range 1 to 2 magnitudes below the concentrations of these radionuclides in recently generated groundwater. The study gives a survey about the corresponding analytic methods, which are applicable today at the GSF Institute for Radiohydrometry. In addition some information about the detection of ^{39}Ar is provided.

57641 (GSF-R—290, pp 95-101) **Accuracy of the mean residence time determinations (according to the exponential model) on the basis of ^{3}H and ^{85}Kr contents of the groundwater.** Salvamoser, J. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The ^{3}H and ^{85}Kr contents of the groundwater are used for comparing the accuracy of the mean residence time determinations of groundwater, according to the exponential model. The differences between both input functions are briefly described.

57642 (GSF-R—290, pp 113-132) **Investigations on the carbon balance of the unsaturated and the saturated zones in a carbonate gravel.** Merkel, B.; Eichinger, L. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In the quaternary aquifer of the Munich gravel plane the carbon balance of the water-unsaturated and the water-saturated zones are investigated. Ground air samples are taken at different depths of down to 26 m in the water-unsaturated zone. In addition, also groundwater samples are extracted. Besides CO_2 concentration determinations and water-chemical examinations the environmental isotopes ^{3}H, ^{14}C and ^{13}C are investigated. The highest CO_2 concentrations (1.2 - 1.5 vol.%) were found in the summer months at a depth of 1 to 5 m. The CO_2 generation rates were estimated. With increasing depth the ^{14}C concentrations measured in the ground air showed a decrease from 120% modern down to 80 - 85% approx. The initial ^{14}C concentrations of the groundwater samples, which were calculated with different ^{14}C concentrations showed good correlation. The ^{14}C concentrations measured in the groundwater samples apparently indicate an insignificant carbon exchange between the carbon contained in the seepage water and that contained in the CO_2 of the ground air.

57643 (GSF-R—290, pp 133-138) **Contribution to the comparison of ^{39}Ar and ^{14}C concentrations in the groundwater.** Loosli, H.; Forster, M. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

This study reports about the comparative ^{39}Ar and ^{14}C concentration measurements performed on a sandstone aquifer in the Saarland. From the results a region suitable for the groundwater determination could be established, which also considers the limestone strata covering one water withdrawal site. The effects and influences of a subterranean ^{39}Ar production in such an aquifer can be neglected, since the production ranges below 1% of ^{39}Ar modern.

57644 (GSF-R—290, pp 238-254) **Isotope-hydrologic investigations in the left-Rhenish parts of Duesseldorf.** Lehmann, G.; Drost, W.; Rauert, W.; Stichler, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In the left-Rhenish districts of Duesseldorf isotope-hydrologic investigations were applied for detecting locally produced groundwater and also rhine bank filtrates. The flow conditions of the groundwater are not stationary, i.e. the flow varies, depending on the water level of the Rhine.

57645 (GSF-R—290, pp 302-308) **Measuring the content of ^{85}Kr in the groundwater of well 3 in Sallern near Regensburg.** Salvamoser, J. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The results of measurements on the contents of ^{3}H performed over several years in Sallern near Regensburg, were approximately 30 to 40 TU. Experimental concepts basing on the supplementary determination of the ^{85}Kr content permit the conclusion that groundwater is composed by one old (free of ^{3}H) and one young component being a portion of about 40% and having a mean residence time of approximately 2 years. The contents of ^{14}C of both constituents are also estimated.

57646 (GSF-R—290, pp 389-394) **Behaviour of the radionuclides ^{131}J, ^{85}Sr, ^{134}Cs and ^{144}Ce in typical unconsolidated rock material, coming from northern Germany, under conditions of water-saturated flow.** Klotz, D.; Lang, H.; Oliv, F. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The investigations described in this study serve to acquire experimental data permitting to establish a propagation model. This model indicates the migration of radionuclides occurring with the water-saturated flow of ground-water in porous aquifers in the surroundings of Gorleben/Lower Saxony.

57647 (INIS-mf—8192) **Water monitoring system of Lower Saxony. Radioactivity monitoring of surface waters.** (Niedersaechsisches Ministerium fuer Ernaehrung, Landwirtschaft und Forsten, Hannover (Germany, F.R.)). Aug 1982. 31p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83781133.

The Land of Lower Saxony started to establish a quality detection and monitoring system for larger surface waters. In addition, a radioactivity monitoring system has been set up for the purpose of supplying data for projects planned by the River Boards and for measures to be taken to fulfill national or international obligations. The system covers a variety of measuring stations where the data are obtained by continuous and manual sampling, laboratory tests of mixed samples, and by automatic measurement. These measurements are supplemented by individual sampling of suspended matter, sediments and organisms.

57648 (INIS-mf—8473, pp vp) **Particulate transport of cesium in groundwater.** Champ, D.R.; Merritt, W.F. (Atomic Energy of Canada Ltd., Chalk River, Ontario. Chalk River Nuclear Labs.:. [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

The migration of cesium-137 fixed to fine particles is suggested as one mechanism to explain the anomalous behaviour of cesium-137 released from glass blocks buried below the water table at Chalk River. A cesium-137 plume of low activity has been noted which extends at least four times further than predicted by a one-dimensional exchange equilibrium model. Soil columns prepared from undisturbed horizontal cores taken adjacent to the glass block site and spiked with cesium-134 have been used to show that low levels of cesium-134 are continuously released from the columns. Further, the cesium-134 is associated with particles 0.2 to 1.0 micrometer in size which are generated in and released from the column. Cobalt-60 gamma-irradiation experiments have shown that microorganisms are involved in the release or formation of particles associated with the transport of cesium-134 from the columns. The particulate transport of low levels of radiocesium from waste management areas may become a significant pathway for biosphere interaction in the case of high level waste management areas containing large amounts of radiocesium.

57649 (INIS-mf—8473, pp vp) **Continuous monitoring of ^{226}Ra in water.** Busigin, C.J.; Philips, C.R. (Toronto Univ., Ontario (Canada). Dept. of Chemical Engineering and Applied Chemistry). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

An instrument for the continuous monitoring of ^{226}Ra in water was developed at the University of Toronto. The present work comprises an analyis of the response of the continuous monitor to transient ^{226}Ra concentrations.

57650 (KFK—3530) **Determination of Pu-241 by liquid scintillation counting in liquid effluents of the Karlsruhe Nuclear Research Center.** Godoy, J.M.; Schuettelkopf, H.; Pimpl, M. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Hauptabteilung Sicherheit). Apr 1983. 36p. (In German). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751168.

A procedure was developed to measure Pu-241 by liquid scintillation counting. Sample preparation was performed by electroplating of plutonium on stainless steel planchets. To correct the selfabsorption, the linear dependence of counting efficiency in the liquid scintillation counter from the resolution in the alpha spectrometer was used. Pu-238, Pu-239+240 and Pu-241 were measured in the liquid effluents of the Karlsruhe Nuclear Research Center (KfK). The concentrations in monthly mixed samples ranged from 0.07 until 46 nCi Pu-238/m^3, from 0.13 until 2.1 nCi Pu-239+240/m^3 and from 25 until 190 nCi Pu-241/m^3. Between 5.4% and 41% of the plutonium content of the KfK waste water are released to the River Old Rhine. The values for the activity ratio Pu-238/Pu-239+240 are between 0.39 and 1.1 and for Pu-241/Pu-239+240 are between 11 and 300. The mean value for Pu-241/Pu-239+240 is 61. The dose exposure of the environmental population of the Karlsruhe Nuclear Research Center caused by released Pu-241 is negligible low.

57651 (TVA/PUB—84/1) **Preconstruction radioactivity levels in the vicinity of the proposed Clinch River Breeder Reactor Project 1982.** (Tennessee Valley Authority, Muscle Shoals, AL (USA). Radiological Health Staff). Jul 1983. 34p. NTIS, PC A03/MF A01. Order Number DE84900078.

Routine samples of ground water, river water, and bottom sediment were collected from the Clinch River in 1982 in the preconstruction-construction phase of the Clinch River Breeder Reactor Project (CRBRP) environmental radiological monitoring program. The results obtained from the analysis of these samples are

similar to those reported earlier. The only significant radioisotopes identified in sediment samples were ^{137}Cs, ^{60}Co, and the naturally occurring ^{40}K. With the exception of tritium, no significant radioactivity was detected in ground or surface water at the CRBRP site. The external gamma radiation levels measured at the CRBRP site averaged 18.8 +- 3.5 mR/quarter for 1982 (Table 8). This is consistent with levels measured at TVA's nonoperating nuclear power plant construction sites.

57652 (UILU-WRC—83-0180) Hydrogeologic and geochemical studies of selected natural radioisotopes and barium in groundwater in Illinois. Final report. Gilkeson, R.H.; Cartwright, K.; Cowart, J.B.; Holtzman, R.B. (Illinois State Geological Survey, Champaign (USA); Florida State Univ., Tallahassee (USA); Argonne National Lab., IL (USA)). May 1983. Contract W-31-109-ENG-38. 97p. NTIS, PC A05/MF A01. Order Number DE84001404.

Dissolved concentrations of the natural radioisotopes ^{222}Rn, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{232}Th, ^{234}U and ^{238}U and the element Ba^{2+} were investigated in a study of high concentrations of ^{226}Ra, ^{228}Ra, and Ba^{2+} in groundwater from the Cambrian and Ordovician bedrock of northern Illinois. The high radium and barium concentrations are naturally present in the major aquifers - the sandstone bedrock; therefore, remedial well construction measures will not lower the concentrations. The combined concentrations of ^{226}Ra and ^{228}Ra range from 2.3 to 50.2 pCi/L; the majority of analyses exceed the limit in the drinking water regulations of 5.0 pCi/L. The $^{226}Ra/^{228}Ra$ activity ratio ranges from 0.2 to 41.0; a ^{226}Ra analysis has no validity for predicting the ^{228}Ra concentration. Important controls on dissolved ^{226}Ra concentrations are secondary U on the sandstone matrix and the ionic strength of groundwater. The distribution of accessory minerals that contain ^{232}Th is believed to be an important control on dissolved ^{228}Ra concentrations. Locally the dissolved ^{226}Ra and ^{228}Ra concentrations are affected by dissolution-precipitation of secondary barite. Dissolved concentrations of ^{222}Rn and U are less than proposed drinking water regulations. The extreme enrichment in ^{234}U that occurs widespread in groundwater from the Cambrian and Ordovician bedrock is unique and problematic. The enrichment may reflect recharge of uranium to the bedrock by glacial processes. Dissolved Ba^{2+} concentrations range from $<$ 0.01 to 22.4 mg/L. The high Ba^{2+} concentrations occur in groundwater that is depleted in dissolved SO_4^{2-} by anaerobic microbial reactions. A map presents the distribution of Ba^{2+} in groundwater from the Cambrian and Ordovician bedrock in northeastern Illinois. 60 references, 13 figures, 3 tables.

57663 Radium, thorium and radioactive lead isotopes in groundwaters: application to the in situ determination of adsorption-desorption rate constants and retardation factors. Krishnaswami, S.; Graustein, W.C.; Turekian, K.K; Dowd, J.F. (Yale Univ., New Haven, CT). *Water Resources Research;* 18: No. 6, 1633-1675(Dec 1982).

Five groundwater samples taken from different hydrogeologic settings in Connecticut were analyzed for major cation chemistry and the concentration of U and Th decay series nuclides ^{238}U, ^{234}Th, ^{226}Ra, ^{222}Rn, ^{210}Pb, ^{210}Po, ^{230}Th, ^{228}Th, and ^{224}Ra. The concentration of ^{222}Rn in the waters ranged between 10^3 and 10^4 dpm l^{-1} and was three to four orders of magnitude greater than that of the short-lived alpha daughters ^{224}Ra, ^{228}Ra, and ^{234}Th, even though the rates of supply of these four nuclides to solution are expected to be similar. We infer that sorption removes radium and thorium from these groundwaters on a time scale of 3 minutes or less. The ($^{224}Ra/^{228}Ra$) and ($^{234}Th/^{228}Th$) activity ratios in these waters indicate that desorption of these nuclides occurs on a time scale of a week or less and that equilibrium between solution and surface phases is established. In situ retardation factors for radium, thorium, and lead may therefore be caluculated directly from the isotopic data; values range from 4,500 to 200,000. Neither sorption time scales nor retardation factors are strongly dependent on the nuclide or on hydrogeology of the aquifer. Since our study includes nuclides with diverse chemical properties, we suggest that other uncomplexed heavy metals and transuranic elements will also behave in a manner similar to those measured here. The approach presented here should therefore find application in developing site-specific models of the transport of radioactive or stable elemental waste through water-saturated media.

5204 Thermal Effluents Monitoring And Transport

57654 (DOE/EV/10259—1) Geographic analysis of thermal equilibria: a bioenergetic model for predicting thermal response of aquatic insect communities. Technical progress report, January 1, 1983-December 31, 1983. Proposed research program, January 1, 1984-December 31, 1984. Vannote, R.L.; Sweeney, B.W. (Academy of Natural Sciences, Avondale, PA (USA). Stroud Water Research Center). 30 Sep 1983. Contract AC02-79EV10259. 202p. NTIS MF A01. Order Number DE84000871.

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The objective is to test and refine a proposed conceptual model describing the effects of natural and altered temperature regimes on larval growth and adult size and fecundity of hemimetabolous aquatic insects. The model predicts that geographic range extension away from a location with an optimum thermal regime would be associated with temperature induced changes in the rate and efficiency of energy use, developmental processes, and generation time. To test and refine the model, we proposed to study the growth, development, metabolism, and reproduction of a large number of aquatic species in both the natural riverine environment and under controlled laboratory conditions. Field studies were designed to focus on several populations of each species at various locations along a natural thermal gradient throughout their geographic range. Laboratory studies would emphasize the relative importance of temperature and nutrition on larval growth and adult reproduction of a number of aquatic species commonly represented at our field sites. This progress report summarizes results of field and laboratory experiments during the first four sampling years (October 1979-September 1983) describes work still in progress, and outlines proposed research and analysis for the fifth sampling year (October 1983-September 1984). This report also discusses any modifications of the original work plan that had to be made to improve both the quality and quantity of our field data.

57655 (KFK—3475) Investigations of wasted heat transport from flowing water bodies to the atmosphere. Poss, G. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Lab. fuer Aerosolphysik und Filtertechnik 1). Mar 1983. 67p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751141.

The construction, location and equipment of the Rheinhausen measuring station are described. Subjects of the examinations are the sensible and latent heat flux from the water surface, the heat radiation balance and the visibility above the river. The recording of the measuring data and the theoretical foundations of the applied measuring methods are represented. The investigated transport coefficients for evaporation and convection show the dependence of the vertical quality transport on the meteorological boundary conditions such as stratification and wind velocity. A comparison between the directly measured evaporation and the calculations based on different customary formulars gives high deviations. The results one can derive from this report with respect to the thermal loadability of rivers are restricted due to the short measuring periods (max. 1 week). For reliable statements long range measurements (years) are needed. Furthermore the Bowen Ratio validity, the behaviour of the heat transfer number α and the meaning of wasted heat ingestion in connection with visibility measurements as well as the local orographic influence on the wind field are described.

5205 Site Resource And Use Studies

REFER ALSO TO CITATION(S) 56970, 56972

53 ENVIRONMENTAL-SOCIAL ASPECTS OF ENERGY TECHNOLOGIES

5301 Social And Economic Studies

57656 (IIUG-pre—82-4) Offsetting environmental quality. Lederer, K. (Wissenschaftszentrum, Berlin (Germany, F.R.). Internationales Inst. fuer Umwelt und Gesellschaft). 1982. 21p. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

The present contribution deals with a topic of some tradition: a revision of National Income Accounting (NIA) according to general changes in awareness since the introduction of its presently applied outline. The contribution is restricted to one aspect of this topic, i.e. the modification of the Gross National Product (GNP) through the environmental use and deterioration. Based on examples, four different approaches to such a modification are discussed with respect to their validity and present feasibility: 1. monetarization of pollution, 2. other universal measurements for pollution, 3. environmental indicators, and 4. environmental effects on the quality of life.

5302 Assessment Of Energy Technologies

REFER ALSO TO CITATION(S) 57253

5303 Environmental Impact Statements

REFER ALSO TO CITATION(S) 56976, 56977

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

57657 Operative environmental temperatures and basking behavior of the turtle Pseudemys scripta. Crawford, K.M.; Spotila, J.R.; Standora, E.A. (State Univ. College at Buffalo, NY). *Ecology;* **64**: No. 5, 989-999(1983).

Operative environmental temperatures (T/sub e/, an index of the thermal environment) were measured for basking Pseudemys scripta in South Carolina. Operative environmental temperatures were good predictors of the basking behavior of P. scripta. Turtles in this study generally did not bask unless T/sub e/ was 28°C (preferred body temperature) or higher. This demonstrated that basking was not a random behavior in respect to T/sub e/, and implicated thermoregulation as a major factor eliciting basking behavior. Operative environmental temperature was positively related to shortwave and total solar radiation as well as to air and substrate temperature. Substrate temperature was the best single predictor of T/sub e/. A multiple regression equation (T/sub e/ = 0.005R + 0.103T/sub a/ - 1.16 log V + 0.932T/sub s/ - 2.54, r^3 = .90, where R = total radiation in watts per square metre, T/sub a/ = air temperature in degrees Celsius, V = wind speed in metres per second, and T/sub s/ = substrate temperature in degrees Celsius) defines the relationship of T/sub e/ to microclimate variables. Movement of the sun through the day results in spatial variation in T/sub e/'s available to turtles and influences their location and basking behavior.

5502 Biochemistry

57658 (BNL—33667) Application of synchrotron radiation to trace-element analysis in occupational health research. Gordon, B.M.; Jones, K.W.; Kraner, H.W.; Hanson, A.L. (Brookhaven National Lab., Upton, NY (USA)). 1983. Contract AC02-76CH00016. 7p. (CONF-8306128—1). NTIS, PC A02/MF A01. Order Number DE84000538.

From IAEA coordinated research programme on applications of nuclear related techniques in occupational health; Lund, Sweden (13 Jun 1983).

X-ray fluorescence techniques have a number of features that make them attractive for application to biomedical samples, including: they are nondestructive; they are absolute techniques (as is neutron activation analysis) wherein cross sections and absorption coefficients are known and standards are set for geometry determinations; the chemical form of the trace element will not affect the analysis as it could in techniques using ion sources; only small amounts of sample are required, and these can be prepared with a minimum of handling; fine spatial resolution and mapping of elemental distributions in a sample is possible; and sensitivity is a continuous and slowly varying function of atomic number. Synchrotron radiation x-ray sources have been developed and, because of their properties, their use can improve the sensitivity for trace element analysis by two to three orders of magnitude. Also, synchrotron radiation will make possible an x-ray microprobe with resolution in the micrometer range. The National Synchrotron Light Source (NSLS), a dedicated synchrotron radiation source recently built at Brookhaven National Laboratory, will have a facility for trace element analysis by x-ray fluorescence and will be available to all interested users.

57659 (DOE/EV/04962—4) Nucleic-acid protein interactions: conformational studies. Progress report, May 1982-September 1983. Fasman, G.D. (Brandeis Univ., Waltham, MA (USA)). Sep 1983. Contract AC02-78EV04962. 5p. NTIS, PC A02/MF A01. Order Number DE84001272.

Research progress is reported in the following areas: (1) nick translation of HeLa cell nuclei as a probe for locating DNAse 1 sensitive nucleosomes; (2) effect of a high mobility group protein (HMG 17) on the structure of acetylated and control core HeLa cell chromatin; (3) the conformation of the control and acetylated HeLa stripped chromatin after reassociation with H1, and (4) the structure of chromatin reconstituted with phosphorylated H1. (ACR)

57660 In vivo determination of the pyridine nucleotide reduction charge by carbon-13 nuclear magnetic resonance spectroscopy. Unkefer, C.J.; Blazer, R.M.; London, R.E. (Los Alamos National Lab., NM). *Science (Washington, D.C.);* **222**: 62-65(7 Oct 1983).

An intracellular coenzyme has been observed by carbon-13 nuclear magnetic resonance spectroscopy. The pyridine nucleotides in Escherichia coli were specifically labeled with carbon-13 from the biosynthetic precursor, nicotinic acid. The intracellular redox status and metabolic transformations of the pyridine nucleotides were examined under a variety of conditions. A highly reduced nicotinamide adenine dinucleotide pool was observed under anaerobic conditions only in cells that were cultured aerobically on glycerol.

57661 An assignment to internal soliton vibrations of laser-Raman lines from living cells. Lomdahl, P.S. (Los Alamos National Lab., NM); MacNeil, L.; Scott, A.C.; Stoneham, M.E.; Webb, S.J. *Physics Letters [Section] A;* **92A**: No. 4, 207-210(8 Nov 1982).

The internal oscillations of an alpha-helix soliton (the Davydov soliton) are studied numerically and compared with recently measured laser-Raman spectra on metabolically active E. coli. Agreement between calculated and measured spectra strongly supports the idea that the soliton is a possible mechanism for transport and storage of biological energy in proteins.

57662 **O^6-methylguanine-DNA methyltransferase in wild-type and ada mutants of Escherichia coli.** Mitra, S.; Pal, B.C.; Foote, R.S. (Oak Ridge National Lab., TN). *Journal of Bacteriology;* 152: No. 1, 534-537(Oct 1982).

O^6-Methylguanine-DNA methyltransferase is induced in Escherichia coli during growth in low levels of N-methyl-N'-nitro-N-nitrosoguanidine. We have developed a sensitive assay for quantitating low levels of this activity with a synthetic DNA substrate containing ^{3}H-labeled O^6-methylguanine as the only modified base. Although both wild-type and adaptation-deficient (ada) mutants of E. coli contained low but comparable numbers (from 13 to 60) of the enzyme molecules per cell, adaptation treatment caused a significant increase of the enzyme in the wild type but not in the ada mutants, suggesting that the ada mutation is in a regulatory locus and not in the structural gene for the methyltransferase.

57663 **The human protein index.** Anderson, N.G.; Anderson, L. (Argonne National Lab., IL). *Clinical Chemistry (Winston-Salem, North Carolina);* 28: No. 4, 739-748(1982).

The feasibility of constructing a human protein index and the data base associated with it is discussed. The index would be used to explore molecular anatomy and pathology of human cells. At present, the index is closely tied to the only technique that provides the requisite resolution: two-dimensional electrophoresis. Mapping of human cells, tissues and body fluids together with the mapping of micro-biopsy samples of tissues from individuals with many different diseases should create a systematic description of disease at the protein level. (JMT)

57664 **Synthesis and properties of cyclic peptides containing the activation site of plasminogen.** Ganu, V.S.; Shaw, E. (Brookhaven National Lab, Upton, NY). *International Journal of Peptide and Protein Research;* 20: 421-428(1982).

The activation of plasminogen results from proteolytic cleavage of the Arg_{560}-Val_{561} bond by plasminogen activators. This region of the zymogen occurs in a small disulfide loop that must restrict the conformation around this bond. The nonapeptide sequence NH_2-Cys-Pro-Gly-Arg-Val-Val-Gly-Gly-Cys-NH_2 of plasminogen containing the activator sensitive arginyl valine bond was synthesized by carbodiimide coupling of Boc-Cys-Pro-Gly-OH(S-4-methylbenzyl) to NH_2-Arg(NO_2)-Val-Val-Gly-Gly-Cys-NH_2 (S-4-methylbenzyl), followed by HF treatment and $K_3Fe(CN)_6$ oxidation to form a disulfide bond. Purified peptide was not a substract for urokinase (UK) or plasminogen activator (PA) but possessed a slightly inhibitory activity towards PA. Addition of a lysine to the N-terminus of the nonapeptide yielded a decapeptide sequence of plasminogen that was a better substrate for UK but not for PA. The decapeptide inhibits PA slightly but not UK. These results suggest that active site geometry for PA must be more restrictive than that of UK and that other regions may be involved in the productive interactions with the activators inducing a better fit of the cyclic peptide loop.

57665 **Growth of Lactobacillus casei in deuterated media: purification of deuterated thymidylate synthase and proton nuclear magnetic resonance studies.** Aull, J.L. (Auburn Univ., AL); Crespi, H.L.; Williams, D.E.; Evanochko, W.T. *Biochimica et Biophysica Acta;* 709: 310-317(1982).

The purification of thymidylate synthase from amethopterin-resistant Lactobacillus casei grown in a deuterated medium is described. The deuterated enzyme and the non-deuterated enzyme appear to be identical with respect to specific activity, pH optimum, electrophoretic mobility on polyacrylamide gels and ability to form ternary complexes with 5-fluoro-2'-deoxyuridine 5'-monophosphate (FdUMP) and 5,10-methylenetetrahydrofolate. The deuterated enzyme remained stable at 25°C for 8 h during the acquisition of 400 MHz ^{1}H-NMR spectra and was stored at 5°C for 3 months without loss of catalytic activity. The incorporation of deuterium was essentially complete as demonstrated by a comparison of the NMR spectra of deuterated and non-deuterated enzyme. Proton NMR data obtained with deuterated thymidylate synthase and ^{1}H-FdUMP are in agreement with the fluorine-19 NMR studies of Lewis et al., which support the formation of a binary complex where the enzyme is covalently linked to carbon 6 of 5-fluoro-5,6-dihydro-2'-deoxyuridylate.

5503 Cytology

REFER ALSO TO CITATION(S) 57676, 57721

57666 **(UCLA—12-1430) Annual progress report, July 1, 1982-June 30, 1983.** (California Univ., Los Angeles (USA). Lab. of Biomedical and Environmental Sciences). 1983. Contract AC03-76SF00012. 87p. NTIS, PC A05/MF A01. Order Number DE84001020.

The research program is carried out in three laboratory units: (1) The Laboratory of Biomolecular and Cellular Sciences focuses on fundamental cellular processes such as proliferation, differentiation, gene expression and ecogenic transformation, particularly as related to endogenous factors and energy-related exogenous factors; (2) The Laboratory of Environmental Biology uses two primary study sites to address basic arid-region process studies. The long range goal of this program is the generation of data which will lead to the development of models having predictive value. Knowledge of physiological processes in both plants and animals, particularly as influenced by environmental conditions, is required to understand the structure and dynamics of the ecosystems. The carbon, nutrient and hydrological cycles require greater attention and will be the subject of research programs in the near future; and (3) The Laboratory of Nuclear Medicine measures the physiological behavior of small parts of the brain and heart in health and disease using radioactive tracer techniques employing emission computed tomography. The method is developed technically by rapidly synthesizing biological indicators labeled with short-lived positron emitting radionuclides produced in the laboratory cyclotron. Mathematical models are developed to explain the body distributions of these indicators which are imaged with emission tomographs. This multi-disciplinary effort finally produces cross-section pictures of body biochemistry obtained noninvasively in living patients. It is expected that this approach will result in earlier diagnosis of disease and more careful monitoring of treatment.

5504 Genetics

57667 **(DOE/EV/03214—21) Research on human genetics in Iceland. Final progress report.** (Iceland Univ., Reykjavik). 30 Apr 1983. Contract AC02-76EV03214. 26p. NTIS MF A01. Order Number DE84001073.

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An overview is presented of a research program whose objective is to link the individual demographic data of the population of Iceland from 1840 to the present to studies in the genetics of first-cousin marriages; studies in the familiarity of breast cancer, heart disease, and mental disorders; and studies on the hereditary analysis of blood groups. (ACR)

5505 Metabolism

REFER ALSO TO CITATION(S) 57478, 57479, 57598

57668 **(CEA-R—5202) Effects of atmospheric humidity on uptake of elemental iodine by plants.** Angeletti, L.; Guenot, J.; Caput, C. (CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses, 92 (France)). 1983. 29p. (In French). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83703735.

A laboratory study was performed under controlled experimental conditions in order to evaluate the effects of the relative humidity and the exposure time on the velocity of deposition of vapour iodine onto aerials parts of plants. The results show that: - the deposition velocity increases by a factor of 2 for each increase of relative humidity of 25%, - the deposition velocity is independent of the exposure time. The foliar uptake of vapour iodine seems to be related both to stomatal opening and cuticular sorption. The importance of cuticular sorption increases rapidly with the relative humidity.

57669 Consumption of fibrinogen during pregnancy. Kuijpers, J.C. Utrecht, Netherlands; Rijksuniversiteit Utrecht (1982). 144p. (In Dutch). Available from Library, KNAW, Kloveniersburgwal 29, 1011 JV Amsterdam (NL).

The aim of this thesis is to investigate the consumption of fibrinogen during pregnancy, under the influence of intravascular coagulopathy. The question is, in which manner and to what degree does intravascular coagulopathy occur during the normal pregnancy and in pregnancy induced hypertension. The measurement of the biological half life of fibrinogen is performed using I^{125} labelled fibrinogen. A calculation is given for the fetal radiation dose during this measurement, which is shown to be no greater than that which occurs from various natural sources of radiation. The stability of the coupling of I^{125} to the fibrinogen preparation used was investigated. Nearly 93% was bound to the intact fibrinogen fraction, 5% to the non-clotting fibrinogen, 1% to the albumin and 1% appeared as free I^{125}. After intravenous injection of the I^{125}-fibrinogen preparation, these proportions changed a little in favour of the clottable fibrinogen fraction.

57670 Aspects of folate metabolism at the dog with special reference to renal folate handling. Van Wyk, J.M. Bloemfontein, South Africa; University of the Orange Free State, Department of Haematology (1979). 212p. (In Afrikaans). Available from the Registrar, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300, South Africa.

The aspects of the kidney handling of folates, using dogs, are examined. Methods and techniques are discussed, as well as the results of the blood- and urine folate fractions after ^{14}C-metheltetrahidrofolate has been given.

5506 Medicine

REFER ALSO TO CITATION(S) 57478, 57480, 57573, 57573, 57666, 57690, 57697, 57703

57671 (DOE/EV/03333—T2) New imaging systems in nuclear medicine. Technical progress report, January 1, 1982-December 31, 1983. Brownell, G.L. (Massachusetts General Hospital, Boston (USA)). 1983. Contract AC02-76EV03333. 20p. NTIS, PC A02/MF A01. Order Number DE84001382.

A new instrumentation concept has been developed for the analogue ring detector (PR-I) and its success has been demonstrated. Software for PRI has been developed. Studies of new instrumentation methods and materials include extension of the analog concepts to higher spatial resolution, higher data rates and cylindrical shaped detectors.

57672 (INIS-SU—179) Radioisotope diagnosis in pediatrics and infantine surgery. Collection of scientific proceedings. (Ministerstvo Zdravookhraneniya RSFSR, Moscow; Tomskij Meditsinskij Inst. (USSR)). 1980. 105p. (In Russian). NTIS (US Sales Only), PC A06/MF A01. Order Number DE84780014.

Items within the scope of EDB have been entered individually into the data base. (ACR)

57673 (Juel-Spez—175) Computer program for the determination of minimal cardiac transit times. Bosiljanoff, P.; Herzog, H.; Schmid, A.; Sommer, D.; Vyska, K.; Feinendegen, L.E. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Medizin). Oct 1982. 44p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751084.

An Anger-Type gamma-camera is used to register the first pass of a radioactive tracer of blood flow through the heart. The acquired data are processed by a suitable computer program yielding time-activity curves for sequential heart segments, which are selected by the region of interest technique. The program prints the minimal cardiac transit times, in terms of total transit times, as well as segmental transit times for the right atrium, right ventricle, lung, left atrium and left ventricle. The measured values are normalized to a rate of 80/min and are compared to normal mean values. The deviation from the normal mean values is characterized by a coefficient F. Moreover, these findings are qualitatively rated.

5507 Microbiology

REFER ALSO TO CITATION(S) 57000, 57019, 57023, 57030, 57053, 57056

57674 (DOE/R4/10469—T1) Water purification and recovery of fertilizer materials by blue green algae (Cyanobacteria). Final report. Bender, J. (Experimental Energy Environment, Atlanta, GA (USA)). [nd]. Contract FG44-81R410469. 8p. NTIS, PC A02/MF A01. Order Number DE84000961.

The object of this research project was to compare the water purification and recovery of fertilizer materials by blue green algae (Cyanobacteria) under thermal and non-thermal or ambient conditions. The thermal tests were conducted in a solar algae growth tank, in which a solar heat exchanger provided thermal conditions of 60 C during daytime hours. 6 figures, 1 table.

57675 Interaction of a DNA-bonding protein, the product of gene D5 of bacteriophage T5, with double-stranded DNA: effects on T5 DNA polymerase functions in vitro. Fujimura, R.K.; Roop, B.C. (Oak Ridge National Lab., TN). *Journal of Virology;* 46: No. 3, 778-787(Jun 1983). Contract W-7405-ENG-26.

The gene D5 product (gpD5) of bacteriophage T5 is a DNA-binding protein that binds preferentially to double-stranded DNA and is essential for T5 DNA replication, yet it inhibits DNA synthesis in vitro. Mechanisms of inhibition were studied by using nicked DNA and primed single-stranded DNA as a primertemplate. Inhibition of T5 DNA polymerase activity by gpD5. The 3' - 5' exonuclease associated with T5 DNA polymerase was not very active with nicked DNA, but inhibition of hydrolysis of substituents at 3'-hydroxyl termini by gpD5 could be observed. T5 DNA polymerase appears to be capable of binding to the 3' termini even when double-stranded regions are saturated with gpD5. The interaction of gpD5 with the polymerases at the primer terminus is apparently the primary cause of inhibition of polymerization.

57676 Bacterial characterization by flow cytometry. Van Dilla, M.A. (Lawrence Livermore National Lab., CA); Langlois, R.G.; Pinkel, D.; Yajko, D.; Hadley, W.K. *Science (Washington, D.C.);* 220: 620-622(6 May 1983). Contract W-7405-ENG-48.

Bacteria were analyzed in a dual-beam flow cytometer after double staining with the fluorescent dyes chromomycin A3 and Hoechst 33258, which bind preferentialy to DNA that is rich in guanine-cytosine and adenine-thymine, respectively. The measurements were indicative of the cellular DNA content and base composition, cell concentration, and proliferative state of the population. The ratio of the chromomycin A3 signal to the Hoechst 33258 signal increased with the guanine-cytosine content of the cellular DNA for the six cultured species measured, following expectation. Bacteria in urine from patients with urinary tract infections were characterized without interference from host cell DNA, debris, or other particulates.

57677 ESR study of the primary electron donor in highly ^{13}C-enriched Chlorobium limicola f. thiosulfatophilum. Wasielewski, M.R.; Smith, U.H.; Norris, J.R. (Argonne National Lab., IL). *FEBS (Federation of European Biochemical Societies) Letters;* 149: No. 1, 138-140(Nov 1982).

The photo-induced electron spin resonance signal of the primary donor $P840^+$ in unit membrane fractions of the title photosynthetic bacterium was measured. Bacteria containing natural isotopic abundances and 82% ^{13}C-enrichment were examined. Second moment analysis of the lineshape of the ^{13}C-enriched $P840^+$ signal shows that $P840^+$ consists of two bacteriochlorophyll a-type macrocycles. The data thus obtained are independent of difficulties in interpreting either peak-to-peak linewidths or ENDOR data with respect to intermolecular spin delocalization.

5508 Morphology

57678 Ovary of Fundulus heteroclitus. Brummett, A.R. (Oberlin Coll., OH); Dumont, J.N.; Larkin, J.R. *Journal of Morphology;* 173: 1-16(1982).

Scanning and transmission electron microscopy, together with dissection and light microscopy, have produced heretofore unavailable structural detail of the ovary of Fundulus heteroclitus. Structural and functional interrelationships among developing follicles and other histological elements, particularly as they might relate to vascularization of follicles, oocyte development, and ovulation, are described and discussed. Mature eggs, ovulated into the ovarian lumen, accumulate in the posterior ovisac region of the ovary prior to oviposition. This ovisac region is thin-walled and apparently nongerminal. The temporary retention of ovulated eggs permits cyclical oviposition even though oogenesis and ovulation are asynchronous. The histological differences between the ovisac and the anterior ovigerous region of the ovary are described. The lumenal epithelium of the ovisac displays a localized population of unusual cells with long cytoplasmic extensions. The ultrastructure of these cells suggests that they might function in the transport of ovulated eggs into the oviduct and/or in secreting the substance (jelly) which forms the surface coat of extruded eggs.

5509 Pathology

57679 Depletion of lymphocyte subpopulations in primary and secondary lymphoid organs of mice by a transplanted granulocytosis-inducing mammary carcinoma. Lee, M.Y.; Rosse, C. (Univ. of Washington, Seattle). *Cancer Research;* 42: 1255-1260(Apr 1982). Contract AT06-79EV10270.

Transplanted CE mammary carcinoma causes a marked increase in the production of neutrophilic granulocytes in mice associated with the expansion of hemopoietic marrow into the peripheral skeleton. Changes in lymphocyte populations in the femoral marrow, the expanding peripheral marrow, and the spleen were examined for a period of 3 weeks post-tumor transplantation using fluoresceinated antisera specific for B- and T-cells. As tumor growth and granulocytic hyperplasia progressed, B- and T-cells became reduced in femoral marrow and the spleen, but lymphocytes of undefined function, devoid of T- and B-cell surface antigens (null cells), transiently increased in femoral marrow and in the spleen. In the expanding peripheral marrow, such null cells increased and remained as the predominant cell type until granulocytic hyperplasia took place. These changes suggest shifts in the site of myelogenous lymphocyte production or in the differentiation program of lymphocytes. The thymus invariably showed marked atrophy which, as shown in adrenalectomized animals, could not be explained entirely by tumor-induced stress. Thus, the massive granulocytopoietic effects of CE mammary carcinoma are coupled with marked changes in lymphocyte populations due, most likely, to the tumor's influence on primary lymphoid organs.

5510 Physiological Systems

REFER ALSO TO CITATION(S) 57713

57680 (GSF-B—1509) Comparison of the effect of the viral paramunity-inducers BCG and levamisole on the growth of a radiation-induced transplanted osteosarcoma in mice. Mueller-Brunecker, G. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Abt. fuer Pathologie). Feb 1983. 133p. (In German). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83751148.

Treatment with paramunity inducers Pind avi and Pind orf resulted in general in a smaller number of tumor takes as compared to BCG, Levamisol or untreated controls. Tumor growth curves were independent of treatment. Each experiment was replicated three times. A comparison of pooled results showed significant differences between Pind avi treatment and untreated controls for each level of tumor cells. When pooling levels of tumor cells and testing each replication separately there was a highly significant difference between Pind avi and controls and Pind orf and controls. BCG and Levamisole showed no significant difference to controls. Pind avi and Pind orf considerably raised the number of tumor cells needed to results in 50% takes. For BCG on the other hand less cells were needed. The TD_{50} with Levamisole was somewhat higher than the TD_{50} of controls. The formation of metastases was infrequent (0,65%), and only seen in lung tissue.

5520 Public Health

57681 (DOE/EV/03490—2302) Dose-response effects of fluoride in mammalian species. Smith, F.A. (Rochester Univ., NY (USA). Dept. of Radiation Biology and Biophysics; Rochester Univ., NY (USA). School of Medicine and Dentistry). 1983. Contract AC02-76EV03490. 29p. (CONF-8306130—1). NTIS, PC A03/MF A01. Order Number DE84000854.

From 17. annual conference on trace substances in environmental health; Columbia, MO, USA (13 Jun 1983).

In man and in other species, a number of undesirable effects have been attributed to fluoride. Since most of these have not been investigated systematically in human subjects, it is often unclear to what extent, if any, fluoride is responsible. Proper dose-response information is lacking. A review of the literature describing some of the better investigated effects of fluoride in man indicates that in residents of the United States: (1) growth is unaffected by waterborne fluoride concentrations of 5 mg F/liter; (2) no renal effects are seen at concentrations of 8 mg F/liter; (3) no increase in skeletal density, as detected on x-ray films, is produced by concentrations of 4 mg F/liter; (4) no increase in the incidence of cardiovascular disease is observed at concentrations of 8 mg F/liter. These concentrations, however, cannot be considered as thresholds.

5530 Agriculture And Food Technology

REFER ALSO TO CITATION(S) 56855, 57276, 57692, 57693, 57694, 57719

57682 (INIS-mf—8046) Use of nuclear technique in agriculture. Wah, C.K. (Department of Agriculture, Kuala Lumpur (Malaysia)). (Department of Agriculture, Kuala Lumpur (Malaysia)). 1981. 3p. (CONF-8106294—8). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84780011.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

A brief description is given of the main activities of the Department of Agriculture, Kuala Lumpur, in using isotopes in radiation in agricultural research, i.e. soil-water-plant relationships, plant breeding, crop protection, biological and ecological studies of insects, use of radiation in pest control programmes and use of radioisotopes in pesticide study.

57683 (INIS-mf—8051) Pakistan's experience in application of nuclear techniques in agriculture and environment. Mujtaba Naqvi, S.H. (Nuclear Inst. for Agriculture and Biology, Faisalabad (Pakistan)). 1981. 12p. (CONF-8106294—4). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703589.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

The history of the use of nuclear techniques describes the range of activities and the practical results obtained in Pakistan so far. Agricultural research in PAEC are mutation breeding of important crops, agronomy of selected mutants, entomology, plant pathology, plant nutrition studies on macro and micro nutrients and their interactions, plant physiology and food preservation. Other activities include national and international co-operation, teaching, training and symposia.

57684 Variation in hormone autonomy and regenerative potential of cells transformed by strain A66 of Agrobacterium tumefaciens. Binns, A.N. (Univ. of Pennsylvania, Philadelphia); Sciaky, D.; Wood, H.N. *Cell;* 31: 605-612(Dec 1982).

Mutant Agrobacterium tumefaciens strain A66 is shown to differ from its wild-type progenitor (strain A6) by a spontaneous

2.7 kb DNA insert into the T-DNA region of its Ti plasmid. Tobacco stems transformed by A66 exhibit an attenuated response characterized by slow growth and shoot proliferation. Clonal analysis demonstrates that this response is due to an alteration in the growth and regenerative potential of transformed cells, rather than to variation in the frequency of fully autonomous cells within the primary tumor. Cloned A66 transformed tobacco cells exhibit an auxin requirement for growth that can be overcome by shoot proliferation. Other host species, however, may complement the A66 mutation yielding fully auxin-independent tumors when transformed by this bacterium.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

57685 Covariate analysis of survival data: a small-sample study of Cox's model. Johnson, M.E. (Los Alamos National Lab., NM); Tolley, H.D.; Bryson, M.C.; Goldman, A.S. *Biometrics;* 38: No. 3, 685-698(Sep 1982).

Cox's proportional-hazards model is frequently used to adjust for covariate effects in survival-data analysis. The small-sample performances of the maximum partial likelihood estimators of the regression parameters in a two-covariate hazard function model are evaluated with respect to bias, variance, and power in hypothesis tests. Previous Monte Carlo work on the two-sample problem is reviewed.

5601 Radiation Effects

REFER ALSO TO CITATION(S) 56948, 56971, 56979, 56989, 57682, 57682, 57683, 57715, 57911

57686 (BMFT-FB-T—83-091) Teratogenic damage from ionizing radiation and radioactive substances in the occupational environment of man and its prevention. Stieve, F.E.; Kistner, G.; Ahrens, E.; Beuningen, D. van; Heinzmann, U.; Konermann, G.; Kriegel, H.; Meyer, I.; Molls, M.; Schmahl, W. (Bundesministerium fuer Forschung und Technologie, Bonn (Germany, F.R.)). May 1983. 171p. (In German). NTIS (US Sales Only), PC A08/MF A01. Order Number DE83751158.

1) UNSCEAR (1977) is stressing the importance of further research of radiation effects on the embryonic development. 2) Assessment and definition of dose limits for the origin and prevention of teratogenic damage from the use of ionizing radiation and radioactive substances. 3) Research of reference material on the current state of awareness of and experience in radiation-induced development disorders in man and animal. Results from animal experiments for the assessment of "dosis minimalis" in medical and technical application. 4) Morphologic changes and functional disorders are detectable at ranges as low as 5 - 10 rad, depending on the type of application and the developmental stage of the embryo. 5) For the first time, results on the teratogenesis after external radiation and incorporation of radioactive substances were yielded by a coordinated project effort. These results could be the basis for the assessment of dose-effect relationships in the embryonic and fetal area. Regrettably, coordinated research in this field will have to be discontinued due to non-availability of funds.

57687 (DOE/EV/03408—27) Physico-chemical studies of radiation effects in cells. Progress report, November 15, 1980-February 14, 1984. Powers, E.L. (Texas Univ., Austin (USA). Lab. of Radiation Biology). 1983. Contract AS05-76EV03408. 24p. NTIS, PC A02/MF A01. Order Number DE84001512.

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The primary interest is investigating and understanding the chemical mechanisms involved in radiation-induced cellular damage. Most recently the perturbating devices have been metals which increase, in various ways and modes, the radiation sensitivity of several cell types. While the chief cell type has been the bacterial spore, chosen because of its biological inertness and its hardiness, allowing it to survive the unphysiological conditions of the physical chemist and, thus, inquiry into the free radical mechanisms involved very soon after energy absorption, recently vegetative cells have been introduced. A number of metals have been used and practically all of them sensitize - but to varying degrees. Straight biological techniques such as the measurement of cell survival under various conditions in the different cells have been used, as well as parallel experiments in pulse radiolysis to attack the specific leads in a chemical fashion suggested by the biology.

57688 (DOE/EV/10721—1) Assessment of the feasibility of studying the potential health effects of the West Valley Solidification Project. Phase II. Matanoski, G.M. (Johns Hopkins Univ., Baltimore, MD (USA)). [nd]. Contract AC02-81EV10721. 16p. NTIS, PC A02/MF A01. Order Number DE84001125.

Portions are illegible in microfiche products.

The activities at West Valley involve potential exposure to ionizing radiation. The health effects from radiation are well known and the projected levels of exposure in this situation are so low as to pose no known health hazard in the community. In such a situation it is not reasonable to propose an expensive, comprehensive and physically invasive screening program for the public unless one could justify the benefits. This report describes a feasible population-based surveillance or disease monitoring system which could be implemented in the West Valley area in order to assess the relevance of any changes in incidence of disease which might be attributable to radiation. The proposed plan is both practical and inexpensive. It would anticipate any potential changes in the health status of the population and provide a means to objectively interpret such changes before major concerns develop.

57689 (DPST—83-319) Georgia fishery study: implications for dose calculations. Turcotte, M.D.S. (Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.). 28 Mar 1983. Contract AC09-76SR00001. 33p. NTIS, PC A03/MF A01. Order Number DE84000830.

Fish consumption will contribute a major portion of the estimated individual and population doses from L-Reactor liquid releases and Cs-137 remobilization in Steel Creek. It is therefore important that the values for fish consumption used in dose calculations be as realistic as possible. Since publication of the L-Reactor Environmental Information Document (EID), data have become available on sport fishing in the Savannah River. These data provide SRP with site-specific sport fish harvest and consumption values for use in dose calculations. The Georgia fishery data support the total population fish consumption and calculated dose reported in the EID. The data indicate, however, that both the EID average and maximum individual fish consumption have been underestimated, although each to a different degree. The average fish consumption value used in the EID is approximately 3% below the lower limit of the fish consumption range calculated using the Georgia data. A fish consumption value of 11.3 kg/yr should be used to recalculate dose to the average individual from L-Reactor restart. Maximum fish consumption in the EID has been underestimated by approximately 60%, and doses to the maximum individual should also be recalculated. Future dose calculations should utilize an average fish consumption value of 11.3 kg/yr, and a maximum fish consumption value of 34 kg/yr.

57690 (GSF-K—91) Radiation doses of gonads of children during X-ray radiography of the abdomen. Menzel, H.J. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Strahlenschutz). Jul 1982. 205p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751105.

A method of calculating the radiation exposure of children's gonads during abdominal X-rays is presented in which the gonadal dose is determined from the dose product per unit area which is measured in every X-ray examination. Until now, gonadal dose determination required complex measurements which, for reasons of time, personnel, and discomfort to the children examined, could not be carried out in routine operation. The method is based on studies carried out by KRAGH on adults using a Mird-5 phantom.

57091 **(IAEA-R—2506-F) Pilotscale studies of dried fish irradiation. Part of a coordinated programme in Asian Regional Cooperative Project on Food Irradiation. Final report for the period 15 November 1979 - 24 February 1983.** Maha, M. (International Atomic Energy Agency, Vienna (Austria)). Mar 1983. 6p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703736.

Pilot scale experiments on irradiation of semi-dried mackerel with regard to shelf-life extension, packaging, transportation and cost-analysis were carried out. The results showed that dipping mackerel in saturated brine for 5 hours and then soaking it in 2% potassium sorbate before sun-drying to approximately 40% moisture content produced a good quality product. Sorbate treatment was effective in controlling mould growth while irradiation with 2 kGy was effective in reducing the bacterial load. Carton boxes were found most suitable as packaging material for irradiated dried fish from the point of view of strength, convenience for irradiation and better dose uniformity ratio than polypropylene bags which have ununiform configuration. Irradiation with doses up to 10 kGy has no significant effect on physical properties of the packaging materials tested. Carton boxes of 20 kg capacity provided with strapping bands are durable for land or sea transportation of dried fish. A radiation dose of 0.5 kGy was sufficient to control insect damage and reduce mould growth on dried fish. Irradiated dried fish can be marketed for 3-4 months at ambient conditions in Jakarta. Small scale consumer studies of irradiated samples using employees of the institute showed no negative reactions. Using the small pilot irradiator at CAIR and assuming 1 kGy minimum dose for dried fish, the total cost of irradiation and packaging was estimated to be approximately 10 U.S. cents/kg of fish, which is about 2-3% of the cost of the product.

57092 **(INIS-mf—8047) Utilization of radioisotopes and irradiation in crop protection research.** Ong, S.H. (Malaysian Agricultural Research and Development Inst., Serdang, Selangor. Crop Protection Branch). 1981. 5p. (CONF-8106294—6). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703591.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

There is a growing realization of the benefits which may be derived from the application of radioisotopes and radiation sources in the different disciplines of crop protection research. Many investigations which might only be carried out with extreme difficulty or not all by conventional methods, could be pursued with relative ease. Radioisotopes and irradiation have been utilized in understanding the physiology and behaviour of pests and their biochemical processes and in consequence, have contributed beneficially to the development of better control techniques and more effective pesticides. On the environmental aspects, radioisotopic techniques have provided a useful tool in understanding the behaviour, metabolism and residues of pesticides in the environment.

57093 **(INIS-mf—8048) Utilization of radiations in mutation breeding of tuber crops.** Kukimura, H. (Institute of Radiation Breeding, Omiya, Ibaraki (Japan)). 1981. 17p. (CONF-8106294—2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703587.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

Most of the tuber crops are vegetatively propagated and their spontaneous mutations have been constructively utilized to practical farming. Significance of utilization of mutations to breeding should not be overlooked, since mutation can be articially induced by various mutagenic agents. In tuber crops, ionizing radiations are mostly applied to induce mutations. Radiosensitivity varies with species, genotypes and organs. For the purpose of mutation induction, 10-20 kR of gamma-rays is given to tubers and/or shoots in sweet potato and 2-10 kR in potato. It should be noted that radiation damage is more or less transmissible to later vegetative generations. A useful character in practical agriculture, the following mutations have been obtained so far: skin colour, short stemmed, changes in dry matter content, total sugars content and tuber yield, earlier maturity and sculf resistance in sweet potato. Skin colour, changes in starch content and stolon length, day-neutral tuberization and cyst-nematode resistance in potato. Apart from mutations, radiation can be utilized for breaking down the incompatibility in sweet potato. Promising mutant clones with probable release in Japan are Kyushu 78 of sweet potato and Koniku 16 and Konkei 55 of potato.

57094 **(INIS-mf—8049) Use of induced mutations in soybean breeding.** Zakri, A.H.; Jalani, B.S.; Ng, K.F. (Malaya Univ., Kuala Lumpur (Malaysia)). 1981. 12p. (CONF-8106294—3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703588.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

Artificial induction of mutation in plants is carried out using \-irradiation and ethyl metanesulphonate (EMS) to expand the genetic variability of locally-grown soybean. This aspect of mutation breeding complements conventional breeding approach undertaken by the Joint Malaysia Soybean Breeding Project group. Recovery of agronomically-important mutants such as earliness, lateness, bigger seed size and improved plant architecture were recorded. The significance of these findings is discussed.

57095 **(INIS-mf—8052) Effect of exposure rate of the growth of soybean seedlings grown from gamma irradiated seeds.** Mohd Yusof, A.; Grunewald, R. (Wisconsin Univ., Milwaukee (USA). Dept. of Botany). 1981. 20p. (CONF-8106294—1). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703586.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

The effect of the gamma (^{137}Cs) total exposure rate of 25 kR delivered at three different exposure rates (887 R/min, 159 R/min and 48 R/min) on soybean seeds was studied by measuring seedling height, cotyledon area, fresh weight, dry weight, Co_2 fixation and RuDP carboxylase activity. The dry weight, CO_2 fixation and irradiated imbibed groups did not show any correlation with exposure rate. Exposure rate effect was shown for the first stage out, no further correlation was observed in the subsequent stages, probably due to the recovery and repair mechanisms that take place as the seedling increases with age. The absence of an exposure rate effect on irradiated imbibed group may be explained in terms of non-detectable damage at a very high dose, since these seedlings exhibited effects that are similar to the effects of seeds exposed to an acute radiation dose.

57096 **(INIS-mf—8053) Root activity studies of cashew plants (Anacardium Occidentale L.) using ^{32}P radioisotope.** Aminuddin, H.; Buggenhout. (Pertanian Univ., Serdang, Selangor (Malaysia)). 1981. 6p. (CONF-8106294—5). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703590.

From Seminar on nuclear techniques in agriculture and environment; Kuala Lumpur, Malaysia (8 Jun 1981).

In this preliminary study, we are looking at levels ^{32}P and depths of soil injections on uptake by plants using the injection techniques in root activity studies. ^{32}P activities can be detected in the leaves and flower parts of plants two weeks after injection in the soil. Reasonable count rate can be obtained by using lower level of ^{32}P (1.6 mCi/tree) than recommended (5 mCi/tree). ^{32}P counts were higher in younger than older leaves. Flowers had the least count. Differences in injection depths (5 and 15 cm) could not be detected. Differences in count rate were detected due to position of leaves and flowers (upper and lower canopy) in some of the sampling intervals.

57097 (INIS-mf—8475, pp vp) **Electron therapy of breast carcinoma. Pt. 2. Early normal tissue reactions.** Toeroek, M.; Petranyi, J.; Farkas, J. 1982. (In Hungarian, English). NTIS (US Sales Only), PC A19/MF A01. (CONF-8209155—Summ.).

From 11. Hungarian congress of radiology; Szeged, Hungary (2 Sep 1982).

Published in summary form only.

57698 (INIS-mf—8561, pp vp) **Serum and tissue lipids in rats exposed to chronic irradiation with uneven daily doses. Part 2.** Ahlers, I.; Ahlersova, E.; Datelinka, I.; Toropila, M.; Praslicka, M. (Univerzita P.J. Safarika, Kosice (Czechoslovakia). Katedra Vseobecnej Biologie). Nov 1982. (In Slovak). NTIS (US Sales Only), PC A07/MF A01. (CONF-8211110—).

From National radiobiology conference; Stary Smokovec, Czechoslovakia (21 Nov 1982).

The animals were irradiated continuously for a period of 10 days with a total dose of 9 Gy. Combined hyperlipemia, the accumulation of triacylglycerols in the bone tissue, and a decreased content of triacylglycerols and phospholipids in the thymus were observed. Serum and tissue lipids returned to normal slowly, the accumulation of triacylglycerols in the bone tissue went back to normal only on day 240 after irradiation.

57699 (INIS-mf—8561, pp vp) **Proliferation activity of regenerating rat liver following chronic irradiation.** Kropacova, K.; Misurova, E. (Univerzita P.J. Safarika, Kosice (Czechoslovakia). Katedra Vseobecnej Biologie). Nov 1982. (In Slovak). NTIS (US Sales Only), PC A07/MF A01. (CONF-8211110—).

From National radiobiology conference; Stary Smokovec, Czechoslovakia (21 Nov 1982).

In the course of chronic irradiation a cumulation of latent damage to components securing mitotic cell division occurs in the liver of animals. The mechanism of DNA replication synthesis in the liver is more seriously affected only during long-term irradiation.

57700 **(INIS-mf—8561) Radiation biology I. Proceedings of national radiobiology conference.** Kalina, I. (ed.). (Ceskoslovenska Vedeckotechnicka Spolocnost, Kosice. Dom Techniky). Nov 1982. 143p. (In Slovak). (CONF-8211110—). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83781134.

From National radiobiology conference; Stary Smokovec, Czechoslovakia (21 Nov 1982).

Individual items in scope for the data base were processed separately.

57701 **(INIS-mf—8562) Studies on the chromosome variation of mouse tumor cell population by radiation and culture condition in relation to tumorigenicity.** Chung, H.W. (Seoul National Univ. (Republic of Korea). Graduate School). 1982. 107p. (In Korean). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781135.

The effects of radiation and culture conditions on the distribution of chromosome number in mouse Sarcoma 180 Y.S. cells were studied in respect to heterogeneity of their chromosome number and their tumorigenicity; four subpopulations separated by ficoll gradient centrifugation from in vivo cultured tumor cells demonstrated different tumorigenic properties and the hypotetraploid cells were found to be the most tumorigenic.

57702 **(INIS-SU—171) Nuclear war hazards. Point of view of Soviet medical scientists.** Chazov, E.I.; Il'in, L.A.; Gus'kova, A.K. (Akademiya Meditsinskikh Nauk SSSR, Moscow). 1982. 148p. (In Russian). NTIS (US Sales Only), PC A07/MF A01. Order Number DE83781136.

Paper copy only, copy does not permit microfiche production. Original copy available until stock is exhausted1 refs.; 9 tabs.

An attempt is made to forecast medical and bilogical and aftereffects of nuclear weapons application in a number of situations. In particular, the effects of a single high-yield air or surface nuclear explosion on a city with 1 million population are considered as well as the aftereffects of the exposure of human beings to local radioactive fallouts outside the ground zero of a surface nuclear explosion. The aftereffects for the population of local and global radioactive fallouts caused by the realization of one of the adopted in the West variants of mass nuclear strives exchange between the hostile sides are estimated. Certain aspects of medical and biological aftereffects of neutron weapons application are discussed.

57703 **(OEFZS-A—0390) DNA metabolism in peripheral lymphocytes of UV-B wholebody irradiated men.** Klein, W.; Kocsis, F.; Altmann, H.; Egg, D.; Guenther, R.; Rauschmeier, W. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H.). Feb 1983. vp. (In German). (BL—414/83). Available by the author, OEFZS, A-2444 Seibersdorf, Austria.

Limited Distribution.

Healthy probands were UV-B irradiated and different times after the treatment blood was taken and lymphocytes were isolated. Semiconservative DNA-synthesis was enhanced after 4 in vivo expositions. DNA repair replication in lymphocytes after in vitro UV-C damage was initially increased in UV-B wholebody irradiated people. With nucleoidsedimentation DNA strand breaks after in vivo UV-B irradiation were detected.

57704 **(RERF-TR—9-81) Primary liver carcinoma and liver cirrhosis in atomic bomb survivors, Hiroshima and Nagasaki, 1961-75, with special reference to HBs antigen.** Asano, M.; Kato, H.; Yoshimoto, K.; Seyama, S.; Itakura, H. (Radiation Effects Research Foundation, Hiroshima (Japan)). Mar 1982. 20p. (In Japanese, English). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703734.

During 1961-75, 128 cases of primary liver carcinoma (PLC) in the RERF Life Span Study extended sample and 301 cases of liver cirrhosis in the RERF Pathology Study sample were observed. All cases were assessed for hepatitis B surface antigen (HB sub(s) Ag) using orcein and aldehyde fuchsin staining. The incidence of PLC was 2.0 times higher in Nagasaki than in Hiroshima which was statistically significant, but the prevalence of liver cirrhosis showed hardly any difference between the two cities. Meaningful findings that may possibly explain the higher incidence of PLC in Nagasaki were that the presence of HB sub(s) Ag in the liver of patients without overt liver disease was 2.3 times higher in Nagasaki than in Hiroshima, and the prevalence of liver cirrhosis associated with PLC, especially that of posthepatitic cirrhosis with PLC, was almost 2.0 times higher in Nagasaki than in Hiroshima. In both cities a suggestive relationship of radiation dose with the prevalence of liver cirrhosis was noted but not with PLC. We believe that the higher incidence of PLC in Nagasaki is attributable to HB virus infection, though other factors, such as immunological competence affected by radiation, cannot be excluded.

57705 **(RERF-TR—11-81) Leukemia incidence among individuals exposed in utero, children of atomic bomb survivors, and their controls; Hiroshima and Nagasaki, 1945-79.** Ishimaru, T.; Ichimaru, M.; Mikami, M. (Radiation Effects Research Foundation, Hiroshima (Japan)). Mar 1982. 10p. (In Japanese, English). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703731.

The incidence of leukemia has been analyzed in relation to the fetal dose of individuals exposed in utero, and the parental gonadal dose of individuals born to atomic bomb survivors and controls in the two fixed RERF cohorts. Among 3,636 in utero exposed children and controls, 3 leukemia cases have been identified through 1979. No excess risk of leukemia for in utero exposed children is apparent. For children born to exposed parents and controls, 36 leukemia cases have been identified in the years 1946-79 among 50,689 study subjects where the parental gonadal dose is available. Again, no excess risk of leukemia exists.

57706 **(RERF-TR—12-80(SUPPL.)) Life span study report, 9; 1950-78. Supplementary tables.** (Radiation Effects Research Foundation, Hiroshima (Japan)). 1982. 361p. (In Japanese). (RERF-TR—5-81(SUPPL.)). NTIS (US Sales Only), PC A16/MF A01. Order Number DE83703732.

The RERF life span study report 9 consists of three parts and supplementary tables, each bound separately. Life span study report 9 supplementary tables, supplement to TR 12-80 and TR 5-81, are computer pritouts containing the life span study data from 1950-78. These tables are pertinent only to part 1 (Cancer mortality among atomic bomb survivors, 1950-78) and part 2 (Mortality from causes other than cancer among atomic bomb survivors, 1950-78) of Life span study report 9. This study extends Life span study report

8 by four years from 1975-78. These tables are included following data: The life span study sample, Death certificate data by cause, Malignant neoplasms, Neoplasms generally, Diseases other than neoplasms, Injuries and accidents, Summary of death certificate data.

57707 **(RERF-TR—12-81) Distribution of onset of leukemia among atomic bomb survivors in the leukemia registry by dose, Hiroshima and Nagasaki, 1946-75.** Ishimaru, T.; Ichimaru, M.; Mikami, M.; Yamada, Y.; Tomonaga, Y. (Radiation Effects Research Foundation, Hiroshima (Japan)). Mar 1982. 17p. (In Japanese, English). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703733.

The data from the RERF Leukemia Registry for the years 1946-75 were used to determine the distribution of onset of acute leukemia and chronic granulocytic leukemia among atomic bomb survivors in relation to city, dose, and age at the time of the bomb (ATB). A total of 509 confirmed leukemia cases (297 in Hiroshima and 212 in Nagasaki) have occurred among A-bomb survivors in the open populations of these cities in these years. Analysis revealed that the onset of both acute leukemia and chronic granulocytic leukemia tends to shift to earlier years with increasing dose in Hiroshima, but in Nagasaki, although the onset of both types of leukemia was earlier in the high dose group than in the low dose or control groups, the latter two groups did not differ. The distribution of onset of acute leukemia in the three dose groups also depended upon age ATB. While the distribution of onset of acute leukemia among those survivors whose age ATB was less than 30 differed significantly in the three dose classes, this tendency was not observed among those individuals whose age ATB was 30 years or more. For chronic granulocytic leukemia, the onset was shifted to earlier years in the high dose group than in the control group regardless of age ATB in Hiroshima. These findings support the pattern of leukemogenesis observed in A-bomb survivors in the Life Span Study sample, a fixed cohort, in relation to city, dose, age ATB, and years after exposure.

57708 **Radiation issues for the nuclear industry.** Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). 524p. (CONF-821077—). Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Bethesda, MD 20814, $150.00.

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

These proceedings are organized under the following categories: Radiation Control: New Issues; Exploring the Use of a De Minimus Concept in Radiation Protection; Evolving Radiation Protection Standards; Occupational Radiation Protection: Are We Doing Enough; and Emergency Planning: the Potassium Iodide Issue. A separate abstract was prepared for each of 22 papers for the Energy Data Base (EDB) and for Energy Abstracts for Policy Analysis (EAPA); 6 of the papers are included in Energy Research Abstracts (ERA). Three papers were processed earlier.

57709 **Defective excision of pyrimidine dimers and interstrand DNA crosslinks in rad7 and rad23 mutants of Saccharomyces cerevisiae.** Miller, R.D.; Prakash, L.; Prakash, S. (Univ. of Rochester, NY). *Molecular and General Genetics;* 188: 235-239(1982). Contract AC02-76EV03490.

Excision of pyrimidine dimers and interstrand DNA crosslinks was examined in the deletion mutants rad7-Δ1, rad23-Δ1, and rad7-Δ1 rad23-Δ1. These mutants remove pyrimidine dimers and crosslinks much less efficiently than the RAD^+ strains; only 30-60% of pyrimidine dimers and 25-40% of crosslinks are removed even after prolonged incubation. The rad7 and rad23 mutations may represent defects in protein factors which increase the efficiency of the nicking enzyme complex or make chromatin more accessible to the nicking activity.

57710 **Use of inhibitors of DNA repair in the study of the mechanisms of induction of chromosome aberrations.** Preston, R.J. (Oak Ridge National Lab., TN). *Cytogenetics and Cell Genetics;* 33: 20-26(1982). Contract W-7405-ENG-26.

If cells exposed to X-rays or chemical agents are incubated with inhibitors of DNA repair (cytosine arabinoside or aphidicolin), it is possible to accumulate single-strand gaps in the DNA at repairing regions. Upon reversal of the inhibition, these gaps can interact to form chromosome aberrations. It appears that the aberration frequency observed following treatment with radiation or chemical agents is greatly influenced by the rate of repair of damage that is converted into aberrations. This argument also extends to considerations of the different cell-cycle-stage sensitivities, the relative sensitivities of different species, and the probability of observing interactive effects between two agents. These aspects are discussed in terms of their contribution to the interpretation of the mechanisms of induction of chromosome aberrations.

57711 **DNA repair and chromosome aberrations: interactive effects of radiation and chemicals.** Preston, R.J. (Oak Ridge National Lab., TN). pp 25-35 of Progress in mutation research. Volume 4. Natarajan, A.T. (ed.). Amsterdam, Netherlands; Elsevier Biomedical Press (1982). Contract W-7405-ENG-26.

The possibility of synergistic effects of radiation and chemicals in producing chromosome aberrations is considered. DNA damage that is repaired at very different rates (e.g. 4-nitroquinoline-N-oxide and X-rays) may lead to increased probability of a synergistic effect by increasing the probability that lesions produced as a result of the slower repair are available to interact with lesions produced as a result of the more rapid repair. Results suggest that although the types of DNA damage induced by the two agents are different, they can interact to form an aberration. The probability of producing an aberration from the interaction of 4NQO and X-ray-repairing lesions is increased by inhibiting DNA repair with cytosine arabinoside and such treatment leads to an increase in dicentric frequency over the sum of yields from the separate treatments. An increase in rings following combined treatments was also observed but there was no increase in acentric fragment yields.

57712 **Radioresistance of microorganisms in sewage sludge with special regard to the virus species.** Mayr, A.; Mahnel, H.; Brodorotti, H.S. v.; Ottis, K. (Muenchen Univ. (Germany, F.R.). Inst. fuer Medizinische Mikrobiologie, Infektions- und Seuchenmedizin). pp vp of Desinfection of waste water and sewage sludge. Experimental results. Muenchen, Germany, F.R.; Bayerisches Staatsministerium fuer Landesentwicklung und Umweltfragen (1979). (In German)

Of the viral species present in surface and waste water only entero-, reo-, parvo-, and possibly paramyxoviruses are of relevance. These viruses remain infectious through to the sewage sludge stage, although then only present in small numbers. Bacteria and moulds are present in high concentrations in sewage sludge, the majority being non-pathogenis or only facultative pathogenic species. Of these only Salmonellae are of public health concern. Viruses are considerably more radiation resistant than bacteria and moulds. In sewage sludge a parvo virus was clearly the most resistant towards radiation followed, in order of decreasing resistivity, by reo- and entero-viruses. With the exception of the strongly resistant streptococcus faecalis two enterobacteria and one mould were found to be relatively radiation-sensitive. Gamma radiation is effective for inactivating all viral and bacterial contamination of sewage sludge. The dose required depends upon the radiation resistance and concentration of the individual strain. Enteroviral elimination determines the dose required for viruses and salmonella radiation the dose for bacteria. For practical sewage sludge decontamination a total irradiation dose of 500 krad has been calculated to meet normal requirements, and this dose can be raised to 1 Mrad for more stringent demands.

5602 Thermal Effects

REFER ALSO TO CITATION(S) 57654, 57657

5603 Chemicals Metabolism And Toxicity

REFER ALSO TO CITATION(S) 56828, 57473, 57601, 57631, 57681, 57711

57713 **(DOE/EV/10270—4) Marrow-tumor interactions: the role of the bone marrow in controlling chemically induced tumors. 1983 annual progress report.** (Washington Univ., Seattle (USA). School of Medicine). 1983. Contract AT06-79EV10270. 9p. NTIS, PC A02/MF A01. Order Number DE84001116.

Our work has defined two experimental tumor systems in which we have shown that there is interaction between the bone marrow and certain neoplasms. We have documented that these interactions are important in host responses against tumors. Our experiments have assigned a major role to bone marrow in the growth inhibition of methylcholanthrene-induced (MCA) sarcomas. We have discovered that the bone marrow contains Natural Tumor Growth Regulatory Cells (NTRC) that in collaboration with immunocytes specifially sensitized to a tumor are capable of neutralizing that tumor. In addition, we have shown that a mammary carcinoma of mice significantly alters the pattern of hemopoiesis and disturbs lymphocyte and stem populations in the bone marrow. Our approach has been to pursue multiple convergent lines of attack, since the host response against various cancers is complex, relying on the interaction of several cell types which exercise their tumor neutralization effect probably through various mechanisms. A unique component of our work is the investigation of the influence neoplasms exert on the production of various types of bone marrow cells which can function or can differentiate into cells that participate in the host's antitumor responses. The focus of the work has remained the same and we have continued to define the identity of the bone marrow derived cells involved in tumor neutralization and the mechanisms through which they exert their function.

57714 **(EPA—600/7-83-018) Effects of selected inorganic coal-gasification constituents on aquatic life: an annotated bibliography.** Koch, L.M. (Tennessee Valley Authority, Muscle Shoals, AL (USA). Office of Natural Resources). Mar 1983. 38p. (TVA/ONR/WRF—83/9). NTIS, PC A03/MF A01. Order Number DE83910834.

This review is concentrated on primary inorganic pollutants of concern which result in the aqueous discharges of high-pressure coal-gasification technologies. These pollutants include ammonia, cyanide (thiocyanates), sulfide, and boron. Ammonia toxicity was not reviewed since effective waste treatment technologies and discharge guidelines are available. The open literature concerning the effects of cyanide (thiocyanates), boron, and sulfide on aquatic life was reviewed using computer search techniques. It was concluded that there is a void in the literature concerning the toxicity of these parameters in high-pressure, coal-gasification wastewater matrices. The information abstracted is mainly concerned with laboratory studies with individual constituents; however, some data provide insight to the effects of physical parameters such as temperature and physical stress.

57715 (INIS-mf—8473, pp vp) **Uptake of uranium, thorium and arsenic from refinery residue by Pinus sylvestris L. and the effect on growth.** Sheppard, M.I.; Thibault, D.H. (Atomic Energy of Canada Ltd., Pinawa, Manitoba. Whiteshell Nuclear Research Establishment:. [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

A preliminary experiment was carried out to determine the growth rate and survival of Pinus sylvestris L. (Scots pine) seedlings grown on Welcome Residue Area soil from Port Hope, Ontario, containing uranium, thorium and arsenic. This soil is silt loam in texture, and contains approximately 26 μg U/g, 5 μg Th/g, and 780 μg As/g. The control soil was Woodridge fine sand containing < 0.8 μg U/g, 3 μg Th/g and < 2 μg As/g. The control seedlings developed fascicle needles earlier than the treatment seedlings and the mean fascicle growth rate was 14% greater in the controls. Chemical analyses indicated an acrepetal (tipward) gradient of uranium, thorium and arsenic in the seedlings. The mean concentrations of uranium found in the roots, shoots and fascicle needles were 346, 9 and 4 μg/g dry plant, respectively, approximately 340, 4 and 2 times the quantities found in the control plants. The mean concentrations of thorium found in these plant parts were 4, 1.1 and 0.8 μg/g dry plant, respectively, approximately 10, 0.5 and 1 times the quantities found in the controls. The mean concentrations of arsenic found in the plant parts were 232, 68 and 47 μg/g dry plant respectively, > 23, 340 and > 2300 times the quantities found in the controls. There was, on the average, more uranium, thorium and arsenic found in the tissues of the dead seedlings than in those of the live seedlings. Since the concentrations of both uranium and arsenic appear to be in the phototoxic range and the external radiation dose is small (< 10 μGy/h), it has been concluded that mortality and the morphological differences found were due to chemical toxicity of these elements rather than radiation injury.

57716 **Free cupric ion activity in seawater: effects on metallothionein and growth in crab larvae.** Sanders, B.M. (Duke Univ. Marine Lab., Beaufort, NC); Jenkins, K.D.; Sunda, W.G.; Costlow, J.D. *Science (Washington, D.C.);* **222**: 53-55(7 Oct 1983).

Crab zoeae (Rhithropanopeus harrisii) were exposed during their development to a range of free cupric ion activities regulated in seawater by use of a copper chelate buffer system. Most cytosolic copper was found to be associated with metallothionein. Copper-thionein could be related to free cupric ion activity, and a shift in copper-thionein accumulation was correlated with inhibition of larval growth. These data reveal predictable relations between cupric ion activity in seawater and processes at the cellular and organismic levels.

57717 **Effect of carcinogen dose on the dynamics of neoplastic development in rat tracheal epithelium.** Terzaghi, M. (Oak Ridge National Lab., TN); Nettesheim, P.; Riester, L. *Cancer Research;* **42**: 4511-4518(Nov 1982). Contract W-7405-ENG-26.

The aim was to analyze carcinogen dose effects on the development of carcinogen-altered preneoplastic epithelial cell populations following exposure to 7,12-dimethylbenz(a)anthracene (DMBA). Upon exposure to carcinogen, cells appear in the tracheal epithelium which are distinguishable by an enhanced in vitro growth capacity. Cultures established from carcinogen-exposed cells form expanding epithelial foci (EF). Designated EF-forming units (EFFU), these clonogenic units often escape senescence permanently and may become neoplastic after repeated subculturing. Clonogenic units give rise to subculturable progeny (EFFU/sub s/) and to progeny which became anchorage independent (EFFU/sub s,ag$^+$/). In the tracheal cell culture system, anchorage-independent growth is highly correlated with oncogenicity in vivo. Tracheas were exposed in vivo for 4 weeks to DMBA in doses ranging from 5 to 335 μg. Exposure to DMBA resulted in a 100- to 500-fold increase in frequency of EFFU, but no definitive carcinogen dose-response effect was detected on the number of clonogenic cells forming EF or subculturable EF, although there was some indication that the latter might be increasing with increasing dose. There was a marked carcinogen dose effect on the frequency and rate of appearance of EFFU/sub s,ag$^+$/. The data suggest that the carcinogen dose affects either the rate of growth of EFFU/sub x,ag$^+$/, the cell compartment with neoplastic potential, or the conversion rate of EFFU/sub s/ to EFFU/sub s,ag$^+$/.

57718 **Influence of mercaptoethanol on the isolation of mercury-binding proteins from the gills of Mytilus edulis.** Roesijadi, G.; Drum, A.S. (Batelle, Pacific Northwest Lab., Sequim, WA). *Comparative Biochemistry and Physiology [Part] B: Comparative Biochemistry;* **71B**: No. 3, 455-459(1982). Contract AC06-76RL01830.

Use of the reducing agent 2-mercaptoethanol during extraction and isolation of low mol. wt, mercury-binding proteins of mussel gills resulted in an appearance of significant quantities of mercury associated with substances of <3000 daltons. The source

of this mercury was mercury originally bound to the pellet, high mol. wt proteins, and low mol. wt, mercury-binding proteins. This shift in mercury distribution is regarded as a procedural artifact caused by reduction of mercury-binding sites and possible association of released mercury with mercaptoethanol. Use of mercaptoethanol did not release significant amounts of the metal-binding proteins from the high mol. wt protein pool.

57719 **Uptake and metabolism of ^{14}C anthracene by soybean (Glycine max).** Edwards, N.T.; Ross-Todd, B.M.; Garver, E.G. (Oak Ridge National Lab., TN). *Environmental and Experimental Botany;* **22**: No. 3, 349-357(1982). Contract W-7405-ENG-26.

Soybeans grown in solution culture and in soil containing ^{14}C anthracene assimilated anthracene and translocated it to stems and leaves. Soybeans grown in solution culture and exposed to an atmosphere containing ^{14}C anthracene assimilated the anthracene through the leaves and translocated it to stems and roots. Measurement of $^{14}CO_2$ efflux from the soil grown plants and thin layer chromatography (TLC) of extracts of the plants grown in solution culture demonstrated that soybean plants can catabolize anthracene. Anthracene uptake rates from solution culture were correlated with concentration of anthracene in the solution. Uptake from solution culture exceeded uptake from soil. Greater uptake and catabolism of anthracene was observed from soil at field capacity than from flooded soil.

57720 **Induction and expression of mutations in mammalian cells in the absence of DNA synthesis and cell division.** O'Neill, J.P. (Oak Ridge National Lab., TN). *Mutation Research;* **106**: 113-122(1982). Contract W-7405-ENG-26.

The induction of mutations by the alkylating agent ethyl methanesulfonate (EMS) was determined with Chinese hamster ovary cells maintained in serum-free medium to arrest DNA synthesis and cell division. The arrested cultures were treated with EMS and maintained in serum-free medium for various time intervals post-treatment before serum containing medium was added to initiate DNA synthesis and cell division. The concentration-dependent increase in 6-thioguanine-resistant mutants in the arrested cultures was similar to that found with exponentially dividing cultures when serum was added to the arrested cultures immediately after the EMS treatment; the time course of phenotypic expression was also similar with both cultures. In addition, maintenance of the arrested cultures in serum-free medium for up to 18 days post-treatment resulted in no change in the mutant frequency. This suggests that the mutagenic damage is not removed in these arrested cultures. Furthermore, maintenance of the arrested state for increasing time intervals before serum addition results in decreases in the time necessary for maximum phenotypic expression. Cultures maintained in serum-free medium for 16 days after mutation treatment show complete expression of the mutations with no need for subculture. This last result suggests that the mutagenic damage induced by EMS in Chinese hamster ovary cells is not removed and that this damage results in both the induction and expression of mutation in the absence of DNA replication.

57721 **Cytogenetic studies in animals.** Preston, R.J. (Oak Ridge National Lab., TN). pp 379-388 of Genetic toxicology. Fleck, R.A.; Hollaender, A. (eds.). New York, NY; Plenum Publishing Corp. (1982). Contract W-7405-ENG-26.

A review of current cytogentic assays employed by researchers seeking to estimate the genetic risk to man of chemical agents is discussed. Methods are discussed with reference to determination of clastogenicity, assessment of genetic risk to man. Key points in the analysis at the first, or subsequent divisions, after treatment and in the analysis of cells treated in different cell cycle stages are examined with reference to their utility in assessing the mutagenicity or carcinogenicity of a chemical agent.

57 HEALTH AND SAFETY

REFER ALSO TO CITATION(S) 57035, 57036, 57685

57722 **(CONF-8309152—1) Program for monitoring LDB concentrations in cooling-tower waters.** Porter, W.E. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 10p. NTIS, PC A02/MF A01. Order Number DE84000727.

From Joint Utah conference on industrial hygiene and safety; Salt Lake City, UT, USA (21 Sep 1983).

A brief description is presented in tabular form describing the program employed by the Industrial Hygiene Department of the Oak Ridge National Laboratory to monitor and control levels of Legionella in cooling tower waters. Guidelines are listed to protect personnel from an exposure that could lead to legionnaire's disease.

58 GEOSCIENCES

5801 Geology And Hydrology

REFER ALSO TO CITATION(S) 56853, 56960, 56969, 57614, 57639, 57640, 57641, 57642, 57643, 57644, 57645

57723 **(CONF-8309160—1) Solution of groundwater-flow equations using an orthogonal finite-element scheme.** Yeh, G.T. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 43p. NTIS, PC A03/MF A01. Order Number DE84000690.

From Association for the Advancement of Modelling and Simulation Techniques in Enterprises summer conference; Nice, France (12 Sep 1983).

Portions are illegible in microfiche products.

A new finite-element scheme is presented for approximating the groundwater-flow equation, that will result in a matrix having the properties of the positive type and diagonal dominance. Because of these properties, the matrix equation is amenable to the pointwise iteration solution strategies. This scheme differs from the standard Galerkin scheme in that discretization is performed using a general weighted residual procedure and weighting functions orthogonal to basis functions. Numerical results have been obtained for two verification examples and are compared with results using the conventional Galerkin scheme and with analytical solutions. It is shown that both the direct elimination and pointwise iteration solutions of the new orthogonal finite-element equation yield as accurate results as those obtained by the direct elimination solution of the Galerkin finite-element scheme. However, while the pointwise iteration solution of the Galerkin finite-element method converges for one example, it generated divergent solutions for the other. A demonstration example of steady-state flow in a homogeneous medium is used to compare the utility and versatility of the new scheme with the conventional Galerkin finite-element method.

57724 (GSF-R—290, pp 1-12) **Improvement of the qualitative and quantitative detection of simultaneously present fluorescent tracers by systematic sample treatment.** Behrens, H. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The selective instrumental detection of individual fluorescent tracers in mixtures containing further fluorescent dyes is limited by spectral interferences. Therefore additional separations or other suitable procedures have to be included into the analytic technique. With the method described below, the respective tracer to be detected remains with its initial concentration in the sample and is analysed under the appropriate conditions, whereas the interfering tracers are separated or suppressed. The techniques applied for this base on the facts that 1) the fluorescence intensity of the tracers varies differently when the pH-value changes; 2) the tracers show different absorption behaviour; and 3) they provide different degrees of light sensitivity. The procedures permit for example to

detect uranin when eosin is present in a higher concentration or to detect eosin when amidorhodamin G is present.

57725 (GSF-R—290, pp 13-16) **Investigation on the influence of light on fluorescent tracers.** Behrens, H.; Teichmann, G. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

Published in summary form only.

In Contributions to hydrological tracer methods and their application.

57726 (GSF-R—290, pp 17-29) **Behaviour of hydrologic tracers in selected sands and gravels.** Klotz, D. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The adsorption behaviour of the hydrologic tracers ^{51}Cr-EDTA, $^{82}Br^-$, $^{131}I^-$, Na^+, Cl^-, NO_3^-, uranin, eosin and pyranin was investigated in four selected sands and gravels. The measurements were performed in column and batch setups and also in a groundwater flow model.

57727 (GSF-R—290, pp 30-36) **Experiences made with tritium-containing water used as tracer in laboratory experiments with fluvioglacial gravels.** Klotz, D.; Rauert, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

Batch tests performed on 11 different Bavarian fluvioglacial gravels led to tritium distribution coefficients, which deviated not or only insignificantly from zero within the range of experimental accuracy applied to routine testings. The result of nine flow experiments in a gravelfilled column was a mean retardation factor of 1.01 +- 0.01. These experiments thus showed - as it had been expected - that ^3HHO is not significantly delayed with regard to the flow or movement of the water.

57728 (GSF-R—290, pp 37-49) **Application of tracer probes for determining the effective velocity and the flow direction of groundwaters.** Drost, W.; Gaudlitz, H.; Hefka, R.; Hofreiter, G.; Weindl, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In the last two years the tracer probe has been used for determining the effective velocity and the flow direction of groundwater in about 20 projects, preferably in Holocene and Pleistocene aquifers. The probe resulted to be a reliable measuring device, which permitted an economic realization of the required investigations. If the investigation can be carried out by means of a field logging truck, providing built-in control and measuring equipment, and an installed engine-operated cable drum, only one man is required for operating the tracer probe.

57729 (GSF-R—290, pp 102-112) **Problems connected with the initial ^{14}C content of recently generated groundwaters with regard to groundwater ageing.** Eichinger, L. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

By means of different methods we determined the initial ^{14}C content of recent groundwaters in the investigation area Frankish Alb and its Albvorland. The ^{14}C values found by applying the hydrologic exponential model and the simple chemical mixturing model generally showed good correlation. Individual larger deviations of these values may possibly be attributed to infiltrated river water. Only some of the samples could be compared with other models. With these other models significant differences of the calculated initial ^{14}C content resulted in the comparison with the above-mentioned models.

57730 (GSF-R—290, pp 139-154) **Examples for the combined application of isotope-hydrologic and hydrogeologic investigations.** Batsche, H.; Behrens, H.; Neumaier, F.; Seiler, K.P.; Stichler, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

Groundwater tracings require a particularly thorough preparation in order to ensure a useful performance. It shall be possible to verify the interpretation of the test results by means of other investigation results, because then logic solutions can be found for the existing problems. - Several case studies are given, illustrating that the investigation on the content of environmental isotopes of the groundwaters and the dilution method applied for determining the filtering velocity help to solve hydrologic problems.

57731 (GSF-R—290, pp 202-225) **Isotope measurements on sediments of the Great Arber Lake in the Bavarian Forest.** Michler, G.; Proemper, R.; Rauert, W.; Stichler, W.; Wolf, M. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The results of the ^{14}C analyses performed on samples of three sediment cores taken from the soil of the Great Arber Lake (Bavarian Forest) indicated that these sediments (muds) have a ^{14}C age of about 12,000 years. With high-age samples the results of several spot samples showed good correlation with the pollen analytic dating. The mean sedimentation rates were 0.3 to 0.5 mm per year. In the age range of more than 11,000 years the $delta^{13}C$ and $delta^2H$ values of the muds increased. The course in time of heavy metal concentrations is illustrated by the results of zinc and zirconium determinations. Under the consideration of several ^3H measurements, finally the mean residence time of the Lake water is estimated to be less than two years.

57732 (GSF-R—290, pp 226-237) **Carbon 14 age of wood samples from Upper Bavaria.** Seiler, K.P.; Wolf, M.; Rauert, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

This study reports about ^{14}C model ages of woods coming from the Alm and from the quaternary filling in the valleys of Isar and Loisach. The results are briefly compared and contrasted with the previous theories about the formation of quaternary sediments. For the Loisach valley for example, sedimentation rates of more than approximately 2 mm/a are derived.

57733 (GSF-R—290, pp 272-283) **Isotope-hydrologic investigations in the groundwater winning area of Mitscholz near Neumarkt in Upper Palatinate.** Drost, W.; Klotz, D.; Stichler, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

In the investigation area of Mitscholz near Neumarkt in Upper Palatinate parameters for the groundwater flow and the aquifer are determined by means of isotope-hydrologic methods. These techniques are also applied for detecting the potential propagation of pollutants and their dispersion in the subsoil. According to the measurement results the groundwater and consequently also eventually contaminated water flows southwestwards and thus not to a well situated southward of the investigation area.

57734 (GSF-R—290, pp 284-301) **Tracing of karstic waters in the southern part of the Frankish Alb between the rivers Anlauter, Altmuehl and Danube.** Behrens, H.; Seiler, K.P. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

It is reported about tracing investigations carried out at present in order to detect the passages of waste waters in the Karst of the Southern Frankish Alb. Tracings of karstic waters in the area of karstic watersheds can be performed successfully if the

volume of the karstic ground waters equals the small quantities existing in the area between Altmuehl and Anlauter. In this region the karstic watershed is shifted by a strip of about 1 km width. This shift depends on the recharge and volume of the groundwater. All tracings between Altmuehl and Danube, carried out in the area of the karstic water shed, led to negative results, because in this region the volume of the karstic water is particularly large and since consequently the fluorescent tracers are extremely diluted in the waster masses. The amount of tracer material to be recovered ranges below 10%, if the most frequent distance velocity is below approximately 500 m/d. With higher distance velocities it is sometimes possible to recover more than 50% and even up to 100% of the dyes.

57735 (GSF-R—290, pp 425-452) **Investigation on snow accumulation in the Antarctica.** Reinwarth, O.; Stichler, W.; Rauert, W. Apr 1982. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

In Contributions to hydrological tracer methods and their application.

The scientific programme of the Antarctic expeditions in 1979/80 and 1980/81 to the Filchner/Ronne Ice Shelves and to the Atkay Bay Region included investigations on the determination of the annual snow accumulation rate. The field method comprised snow profiles, density measurements and stratigraphic analyses. In addition snow samples were taken in order to evaluate their isotope contents (^2H, ^3H, ^{18}O) as supplementary information about the accumulation process. The contents of stable isotopes, indicated by the delta^2H values, show distinctly marked seasonal fluctuations. These variations can be referred to the stratigraphic findings, although this attribution varies for the two investigation sites. The seasonal fluctuations of the contents of isotopes moreover permitted the age determination of drilling cores. Thus the measurement period for the accumulation determination could be extended to the last 20 years. As mean annual net accumulation 22 g/cm^2 resulted for the Filchner station, and 34 g/cm^2 for the Atka Bay. For the Filchner drilling the tritium-analysis independently confirmed the time scale derived from the delta^2H values by two predominant peaks, which were attributed to 1965 and 1966.

57736 (GSF-R—290) **Contributions to hydrological tracer methods and their application.** (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Radiohydrometrie). Apr 1982. 475p. (In German). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83751090.

The activities of the Institut fuer Radiohydrometrie of the GSF are mainly devoted to the field of environmental research studying the quality, use and protection from pollution of drinking water which has become scarce in many parts of the world. The knowledge and experience of a variety of scientific disciplines are combined to the common task of developing new tracer methods and selecting suitable hydrogeological methods to allow quantitative studies of the hydrological cycle, from rainfall to surface or sub-surface run-off. The tracers used in these studies are for the most part stable, natural radioisotopes occurring in the hydrological cycle, as well as fluorescent dyes or radionuclides for water labelling. The contributions collected in this volume are grouped according to the above outline of tasks and present a survey of current methods and measurements, illustrating their efficiency in solving hydrological problems.

57737 (GSF-R—291) **Age determination of ground-waters by means of carbon 14.** Eichinger, L. (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H. Muenchen, Neuherberg (Germany, F.R.). Inst. fuer Radiohydrometrie). Feb 1982. 194p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83751136.

At present the age determination of ground-waters aged between 1,500 and approximately 40,000 years is only possible by measuring their ^{14}C content. A precise age assignment can be established in slightly mineralised waters, whereas it becomes vague in mineralised waters, particularly in acidulous springs. In general, additional information and data are required about the ^{13}C, D, ^{18}O, ^3H, ^{85}Kr and the ^{39}Ar contents, about the ph value, temperature and the principal ions.

57738 (ORNL—5888) **MATTUM: a multidimensional model for simulating moisture and thermal transport in unsaturated porous media.** Yeh, G.T.; Luxmoore, R.J. (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 121p. NTIS, PC A06/MF A01. Order Number DE84000347.

This report presents the development of a multidimensional model for simulating moisture and thermal transport in an unsaturated aquifer system using the Integrated Compartment Method (ICM). The entire unsaturated zone is divided into a number of compartments with different sizes and shapes. The Philip-de Vries equations governing moisture movement and heat transfer are integrated over each of the compartments to yield a system of nonlinear ordinary differential equations. The system is then solved by one of the three optional time integration schemes. These include the split explicit, the implicit pointwise iteration, and the matrix inversion iteration schemes. The model is verified by comparing its simulations with that of known analytical computations for simplified cases. Results indicate that the ICM algorithm can indeed simulate moisture movement and heat transfer in accordance with the Philip-de Vries equations. The validation of the model is under further investigation.

57739 (SAND—83-2102C) **Summary of tight-gas-sands sedimentology at the MWX site.** Lorenz, J.C. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 16p. (CONF-8310162—3). NTIS MF A01. Order Number DE84000484.

From Western gas sands sub-program review meeting; Morgantown, WV, USA (18 Oct 1983).

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The depositional environments of the Mesaverde Group of the Piceance Creek basin in northwestern Colorado have determined the basic morphology and characteristics of the tight gas sands reservoirs in the three Multi-Well Experiment wells. The three morphologies, in ascending stratigraphic order, are a blanket type of reservoir (marine to shoreline environment), a lenticular type of reservoir (the paludal and coastal zones of the lower and upper delta plain), and an irregular tabular/elongate reservoir produced by meandering fluvial systems. Internal reservoir discontinuities vary among these types of reservoirs, but consist primarily of permeability barriers and conduits caused by shale breaks and fractures. 10 references, 5 figures.

5802 Geophysics

57740 (INIS-mf—8534) **Stochastic analysis of the earthquake response of structures with a view to soil-structure interaction.** Bauer, J. (Technische Univ. Muenchen (Germany, F.R.). Fakultaet fuer Bauingenieur- und Vermessungswesen). 10 Dec 1980. 114p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703584.

Thesis dealing with the analysis of earthquake response of structures. In order to achieve a reliable risk assessment, the results of the seismic risk analysis have to be seen in an overall view together with the results of stochastic vibrational analyses, and the data on maximum supportable stresses of the structure. Taking into account stochastic seismic focus models and calculation methods is of special significance in this connection. Based upon well-known seismic risk assessment models, the calculation of the annual probability for exceeding the acceleration level is carried out also considering the length of the failure zone, assuming that the energy released during an earthquake is uniformly, distributed over this fracture zone. The strong influence of local parameters on the annual exceeding probability is shown by a sensitivity analysis.

57741 (INIS-mf—8575, pp vp) **Electron microscopic study of the kinetics of mineral formation during experimental crystallization of volcanic glasses.** Kirov, G.; Senderov, E.; Petchigargov, V. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

57742 **Prospecting and exploration of deposits of ores, useful minerals and rocks (Vademecum 1).** Prokop, F.W.; Streck, W. (Gold (O.) G.m.b.H. und Co. K.G., Koeln (Germany, F.R.)); Sagheer, M. (Krupp (Friedr.) G.m.b.H., Duisburg (Germany, F.R.). Industrie und Stahlbau); Tschoepke, R.W. (Grundstofftechnik G.m.b.H., Essen (Germany, F.R.)); Walther, H.W. (Bundesanstalt fuer Geowissenschaften und Rohstoffe, Hannover (Germany, F.R.)); Pietzner, H.; Stadler, G.; Vogler, H.; Werner, H. Krefeld, Germany, F.R.; Geologisches Landesamt Nordrhein-Westfalen (1981). 236p. (In German). Available from Geologisches Landesamt Nordrhein-Westfalen, Krefeld (Germany, F.R.).

Geologists and practical men are given instructions for prospecting and exploring deposits of ores, industrial minerals and useful rocks. The improvements and innovations of the prospecting and exploration technologies as well as the production and processing methods are considered. (Various enclosures, mining laws).

5803 Mineralogy, Petrology, And Rock Mechanics

REFER ALSO TO CITATION(S) 56916, 56917, 56967, 56995, 57418, 57741, 57762

57743 **(GKSS—81/E/64) Chemical composition of sea water and pore water in the manganese nodule area of the Central Pacific.** Marchig, V.; Gundlach, H.; Schnier, C. (GKSS-Forschungszentrum Geesthacht G.m.b.H., Geesthacht-Tesperhude (Germany, F.R.)). Nov 1981. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751161.

Analyses for the following elements were made on 118 samples of pore water and 23 samples of sea water from the radiolarian ooze area of the Central Pacific: Na, Ca, Br, Sr (major elements) and Sc, Cr, Mn, Fe, Co, Ni, Cu, Zn, Se, Rb, Ag, Sb, Cs, Eu, Ta, Hg, U. The average concentration of most of the elements analyzed is higher in the pore water than in the sea water. The enrichment of elements in both the pore water and the bottom near sea water relative to the average composition of the sea water depends on the residence times of the elements in the sea water - the shorter the residence time the greater the enrichment. The enrichment of an element in these sea and pore waters is also dependant on the chemical species in which it occurs in the sea water. The enrichment seems to be greater for hydroxides, less for complex chloride ions and there is no enrichment for simple ions. The enrichment of the elements occuring as hydroxides (Fe, Cu, Cr, Sc, Eu) or complex chlorides (Mn, Ni, Co, Zn, Ag, Hg, Se) results in precipitation from the sea water, which contributes to the growth of the manganese nodules as well as to the genesis of metalliferous sediments in this area. The greater enrichment in the pore water relative to the sea water accounts for the remobilization of these elements from the sediment as the main source of the material for the growth of the manganese nodules.

57744 (INIS-mf—8575, pp vp) **X-ray characteristics of tourmalines from different mineral paragenesis.** Afonina, G.; Bogdanova, L.; Makagon, V.; Vladikin, N.; Bogatyrev, P. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57745 (INIS-mf—8575, pp vp) **Crystal chemistry of high-calcium pyroxenes by X-ray diffraction and Moessbauer study.** Maslenikov, A.; Nikitina, L. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57746 (INIS-mf—8575, pp vp) **Distribution of hydrogen isotopes in chermigite structure.** Nozik, Yu.; Baturin, S.; Urusov, V. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57747 (INIS-mf—8575, pp vp) **Infrared spectra and isomorphism in apatites and biotites from copper-molybdenum deposits in USSR and MPR.** Sotnikov, V.; Stolpovskaya, V.; Berzina, A. (AN SSSR, Novosibirsk). Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57748 (INIS-mf—8575, pp vp) **Determination of submicroscopic structure of minerals by X-ray diffraction technique.** Sherkina, Eh.; Fedorenko, Yu.; Kukovskii, E. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57749 (INIS-mf—8575, pp vp) **Neutron diffraction studies of staurolite.** Tagai, T.; Joswig, W.; Kakitani, S. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57750 (INIS-mf—8575, pp vp) **X-ray quantitative mineralogical analysis using the computer.** Weise, Z.; Krajicek, J. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57751 (INIS-mf—8575, pp vp) **Tool for the detection of low Z elements in mineralogical samples electron energy loss spectroscopy.** Sevely, J.; Gout, R.; Kihn, Y.; Zanchi, C. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57752 (INIS-mf—8575, pp vp) **Composition and genesis of a new variety of rare-earth phosphate in the monazite series.** Nekrasova, R.; Nekrasov, I. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57753 (INIS-mf—8575, pp vp) **Irradiation as a method of mineralogy.** Komov, I.; Alexandrov. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).
Published in summary form only.

57754 (N—8325638) **Use of basaltic magmas to characterize processes in planetary interiors: A test case in the southwestern United States.** Wittke, J. (Lunar and Planetary Inst., Houston, TX (USA)). Aug 1982. 12p. (NASA-CR—170311). NTIS, PC A02/MF A01.

Whether or not basaltic rocks can be used as mantle probes depends upon the degree to which their compositions reflect their source regions rather than their subsequent histories. Mantle heterogeneities in the central Arizona Transition Zone were studied, and the degree to which interaction with the crust has modified the lavas masking these original variations was examined. Basalts from a thick sequence of basaltic flows in the Hickey Formation and two

younger flows were sampled in order to provide a time transgressive suite of rocks. These rocks were dated and an extensive set of analytical data is now available for them.

57755 (ORNL—5950) **Effect of water in salt repositories. Final report.** Baes, C.F. Jr.; Gilpatrick, L.O.; Kitts, F.G.; Bronstein, H.R.; Shor, A.J. (Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 63p. NTIS, PC A04/MF A01. Order Number DE84001149.

Additional results confirm that during most of the consolidation of polycrystalline salt in brine, the previously proposed rate expression applies. The final consolidation, however, proceeds at a lower rate than predicted. The presence of clay hastens the consolidation process but does not greatly affect the previously observed relationship between permeability and void fraction. Studies of the migration of brine within polycrystalline salt specimens under stress indicate that the principal effect is the exclusion of brine as a result of consolidation, a process that evidently can proceed to completion. No clear effect of a temperature gradient could be identified. A previously reported linear increase with time of the reciprocal permeability of salt-crystal interfaces to brine was confirmed, though the rate of increase appears more nearly proportional to the product of $\sigma\ \Delta P$ rather than $\sigma\ \Delta P^2$ (σ is the uniaxial stress normal to the interface and ΔP is the hydraulic pressure drop). The new results suggest that a limiting permeability may be reached. A model for the permeability of salt-crystal interfaces to brine is developed that is reasonably consistent with the present results and may be used to predict the permeability of bedded salt. More measurements are needed, however, to choose between two limiting forms of the model.

57756 (SAND—82-2343) **Fracture mechanics applications in rock-mechanics problems.** Chen, E.P. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 17p. (CONF-831101—1). NTIS, PC A02/MF A01. Order Number DE83007296.

From International symposium on fracture mechanics; Beijing, China (22 Nov 1983).

The application of fracture mechanics principles to the solution of rock-mechanics problems is discussed. Specifically, two examples relating to high-energy gas fracturing and oil-shale blasting are presented to illustrate the point. In high-energy gas fracturing experiments, the way in which elastodynamic fracture mechanics can be used to design the pressure pulse shapes for multiple fracturing around the wellbore is given. In oil-shale blasting, the strain-rate effect can explicitly be treated in terms of fracture-mechanics parameters. This treatment proves to be essential in the development of a damage model which has been used successfully in the evaluation of in-situ oil-shale-retort blast designs.

57757 (SAND—83-1898) **Stress-wave experiments on selected crustal rocks and minerals.** Grady, D.E. (Sandia National Labs., Albuquerque, NM (USA)). Sep 1983. Contract AC04-76DP00789. 44p. NTIS, PC A03/MF A01. Order Number DE84001613.

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Large amplitude compressive stress-wave experiments on selected crustal rocks and minerals have been performed. The materials studied included Vermont marble, Blair dolomite, Oakhall limestone, z-cut calcite and oil shale. In each case specific constitutive features were studied. These features included interrelation of plastic yielding and phase transformation, rate dependent plastic flow, dilatancy under dynamic loading conditions, and energy dissipation at stress amplitudes below measured Hugoniot elastic limits. A new experimental method using in-material mutual-inductance magnetic gauges is also described.

57758 **Gaseous detonations in porous media.** Kauffman, C.W.; Yan, C.; Nicholls, J.A. (Univ. of Michigan, Ann Arbor). *Symposium (International) on Combustion, [Proceedings]*; 591-597(1982). (CONF-820801—). Contract FG19-80BC13407.

From 19. international symposium on combustion; Haifa, Israel (8 Aug 1982).

Applications where it is desirable to increase the permeability of a porous bed include in-situ coal gasification and shale oil retorting and enhanced oil recovery. A closely related problem is that of the breakup of a frozen mass of coal. A heavy walled pipe was filled with solid spheres. The gaseous combustible mixtures tested included hydrogen, methane, and propane, all with oxygen as the oxidizer. A range of initial pressures and mixture equivalence ratios was tested. In each case the variation of wave velocity and pressure along the tube was determined. The spheres caused the detonation velocity to be lower than the theoretical Chapman-Jouguet velocity which would be expected in an open tube of that size. Increase of the initial pressure, diameter of the spheres, and equivalence ratio from lean towards stoichiometric resulted in an increase in detonation velocity. The material of the sphere had a slight effect the steel spheres resulting in higher velocities. An approximate one-dimensional, steady-flow, analytical model which included losses in the reaction zone was developed. This expression was used to calculate the critical condition wherein the detonation would no longer propagate through the porous bed, thus predicting the sphere diameter required for quenching. Finally, some experiments were conducted wherein a large container was filled with coal, mixed with snow, and allowed to freeze. Propane-oxygen was blown through the pile and then detonated. Considerable fracturing was experienced.

5804 Geochemistry

REFER ALSO TO CITATION(S) 57416, 57634

57759 (INIS-mf—8575, pp vp) **Revision of the crystal chemistry of hornblends and alkaline amphiboles, based on infrared data.** Robert, J.; Robert, M.; Morette, Y.; Thauvin, J. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

57760 (INIS-mf—8575, pp vp) **Valency state of manganese in minerals according to X-ray spectroscopy.** Yanchuk, Eh.; Matkovskii, O. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

57761 (INIS-mf—8575, pp vp) **Studies of the crystallochemical peculiarities of jarosite by X-ray and vibrational spectroscopy methods.** Arkhipenko, D.; Bokiy, G.; Palchik, N.; Grigoryeva, T.; Orekhov, B. Sep 1982. NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

57762 (INIS-mf—8575, pp vp) **Thermal stability of heavy elements fission tracks in minerals.** Jovanovich-Kolomeitseva, L. Sep 1982. (In Russian). NTIS (US Sales Only), PC A20/MF A01. (CONF-820956—Absts.).

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Published in summary form only.

57763 **Distribution of anthropogenic CO_2 in the Atlantic and Southern oceans.** Chen, C.T.A. (Oregon State Univ., Corvallis). *Deep-Sea Research, Part A: Oceanographic Research Papers;* **29**: No. 5, 563-580(1982). Contract AT06-81EV10611.

Contours showing the penetration of anthropogenic CO_2 are given for four cross sections in the Atlantic Ocean based on the Geochemical Ocean Sections Study (GEOSECS) CO_2 data and for seven sections in the Southern Ocean based on International Geophysical Year data. The results agree well with tritium and ^{14}C data and indicate that the excess CO_2 has penetrated to below the thermocline everywhere in the Atlantic Ocean and even deeper on the western side. Excess CO_2 has penetrated to the sea floor in the northwest Atlantic Ocean north of about 15°N, to about 2000 m

near the Subtropical Convergence, but only to shallower depths in the Equatorial region. In the Southern Ocean the anthropogenic CO_2 has penetrated relatively deeper in the Drake Passage north of the Polar Front, shallower south of the front, and even shallower outside of the Drake Passage. South of the Polar Front the excess CO_2 penetrates to no more than 500 m and frequently only to 200 m. On the continental shelf the excess CO_2 exists throughout the water column, but little or none can be found in the Antarctic Bottom Water.

57764 **Interpretation of regional geochemistry using optimal interpolation parameters.** Kane, V.E.; Begovich, C.L.; Butz, T.R. (Union Carbide Corp., Oak Ridge, TN). *Computers and Geosciences;* 8: No. 2, 117-135(1982). Contract W-7405-ENG-26.

A collection of data analysis procedures is presented which are derived from estimation of geographic interpolation parameters. Several interpolation models are discussed along with a procedure to obtain the best model. The power parameter, p, and the search radius, c, are the standard parameters in inverse distance weighting interpolation which is appropriate for sampling patterns that are not highly irregular. The power parameter is shown to characterize the regional behavior of geochemical measurements. This characterization process can be used to associate similar types of geochemical measurements, produce optimal contour maps, derive meaningful residual maps, and highlight unusual geochemical areas by a weighted sum variable. The computer program, BESTP, (used to estimate the optimum inverse distance weighting interpolation parameters) is presented, along with an example using reconnaissance groundwater data from the Plainview Quadrangle, Texas.

64 PHYSICS RESEARCH

57765 **(INIS-mf—8560) Seventh conference of Czechoslovak physicists. Part 1. Volume 2.** (Jednota Ceskoslovenskych Matematiku a Fyziku, Prague). 1981. 37p. (CONF-8108164—Pt.1-Vol.2). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83781086.

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Individual items in scope for the data base were processed separately.

6401 Astrophysics And Cosmology

REFER ALSO TO CITATION(S) 57571, 57797

57766 **(DOE/ER/10346—T4) Fundamental studies in isotope chemistry. Progress report, 1 August 1982-1 August 1983.** Bigeleisen, J. (State Univ. of New York, Stony Brook (USA)). 1983. Contract AC02-79ER10346. 70p. NTIS, PC A04/MF A01. Order Number DE84000839.

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Interest in a search for superheavy elements present in nature as a remnant of the big bang or through continuous production by cosmic rays has prompted us to study the isotope chemistry of superheavy elements. Calculations of the fractionation factors of superheavy elements of masses 10, 100, 1000, and in the form of isotopes of hydrogen, carbon, selenium and uranium against the light naturally occurring isotope of the element show that the superheavy isotope, even of infinite mass, will not be sufficiently fractionated in single stage natural processes to obscure its chemistry. Calculations have been made of the elementary separation factors of superheavy isotopes of carbon and oxygen by fractional distillation of CO at 80°K. The fractionation factors are discussed in terms of a model for liquid CO in good agreement with experimental data on $^{13}C^{16}O$ and $^{12}C^{18}O$. Calculations for very heavy isotopic forms of CO reveal for the first time the coupling effect between translation and internal vibration in the liquid. It is shown that a low temperature distillation plant, such as the Los Alamos COLA plant, has a significant potential for enrichment of superheavy isotopes of carbon. The maximum enrichment factor is 10^{85}.

57767 (INIS-mf—8560, pp vp) **How are spirals formed.** Palous, J. (Ceskoslovenska Akademie Ved, Prague. Astronomicky Ustav). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57768 (INIS-mf—8560, pp vp) **Intrinsic polarization of starlight and physical processes in circumstellar envelopes.** Solc, M.; Svatos, J. (Karlova Univ., Prague (Czechoslovakia). Fakulta Matematicko-Fyzikalni). 1981. (In Czech). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57769 (INIS-mf—8560, pp vp) **Acceleration of ^{56}Fe ions in solar flares rich in ^3He and heavy ions.** Slivka, M. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky). 1981. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

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57770 (INIS-mf—8560, pp vp) **Some characteristics of solar flares rich in ^3He.** Slivka, M. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky). 1981. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

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57771 (INIS-mf—8560, pp vp) **Energy spectrum of electrons measured on board Interkosmos-17 satellite.** Kudela, K.; Just, L. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky); Gusev, A.A.; Pugacheva, G.I. (Moskovskij Gosudarstvennyj Univ. (USSR). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki). 1981. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57772 **(LA-UR—83-2844) Inverse comptonization vs. thermal synchrotron.** Fenimore, E.E.; Klebesadel, R.W.; Laros, J.G. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-830797—4). NTIS, PC A02/MF A01. Order Number DE84001039.

From Workshop on high energy transients; Santa Cruz, CA, USA (11 Jul 1983).

There are currently two radiation mechanisms being considered for gamma-ray bursts: thermal synchrotron and inverse comptonization. They are mutually exclusive since thermal synchrotron requires a magnetic field of $\sim 10^{12}$ Gauss whereas inverse comptonization cannot produce a monotonic spectrum if the field is larger than 10^{11} and is too inefficient relative to thermal synchrotron unless the field is less than 10^9 Gauss. Neither mechanism can explain completely the observed characteristics of gamma-ray bursts. However, we conclude that thermal synchrotron is more consistent with the observations if the sources are $\sim$ 40 kpc away whereas inverse comptonization is more consistent if they are $\sim$ 300 pc away. Unfortunately, the source distance is still not known and, thus, the radiation mechanism is still uncertain.

57773 **(N—8324438) A two-point correlation study of interplanetary conditions as observed by Pioneer 12 and IMP 8. Final Report.** Yeh, T. (Eastern Enterprises, Boulder, CO (USA)). Feb 1982. 34p. (AFGL-TR—82-0073; AD-A—113352). NTIS, PC A03/MF A01.

Correlations of interplanetary conditions at two interplanetary points are examined. Indirect comparisons are made between the observational data obtained by the Venus bound space probe, Pioneer 12, and the Earth bound satellite, IMP 8. The correspondence between the data points in the two sets of data is established by the assumption that solar wind streams corotate with the Sun. The streaming plasma in each stream tube is assumed to have a stationary profile under the effects of thermal conduction and solar gravitation.

57774 **(N—8324443) Local standard of rest.** Yuan, C. (City Coll., New York (USA)). 1982. 6p. (NASA-CR—170238). NTIS, PC A02/MF A01.

Under the influence of a spiral gravitational field, there should be differences among the mean motions of different types of objects with different dispersion velocities in a spiral galaxy. The old stars with high dispersion velocity should have essentially no mean motion normal to the galactic rotation. On the other hand, young objects and interstellar gas may be moving relative to the old stars at a velocity of a few kilometers per second in both the radial (galacto-centric), and circular directions, depending on the spiral model adopted. Such a velocity is usually referred as the systematic motion or the streaming motion. The conventionally adopted local standard of rest is indeed co-moving with the young objects of the solar vicinity. Therefore, it has a net systematic motion with respect to the circular motion of an equilibrium galactic model, defined by the old stars.

57775 **(N—8324445) Relationship between Saturn kilometric radiation and the solar wind.** Desch, M.D.; Rucker, H.O. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 22p. (NASA-TM—85004). NTIS, PC A02/MF A01.

Voyager spacecraft radio, interplanetary plasma, and interplanetary magnetic field data are used to show that large amplitude fluctuations in the power generated by the Saturn kilometric radio emission are best correlated with solar wind ram pressure variation. In all, thirteen solar wind quantities previously found important in driving terrestrial magnetospheric substorms and other auroral processes were examined for evidence of correlations with the Saturn radio emission. The results are consistent with hydromagnetic wave or eddy diffusion processes driven by large scale solar wind pressure changes at Saturn's dayside magnetopause.

57776 **(N—8324450) Three dimensional ray tracing Jovian magnetosphere in the low frequency range. Final Report.** Menietti, J.D. (Southwest Research Inst., San Antonio, TX (USA); Jet Propulsion Lab., Pasadena, CA (USA)). Oct 1982. 50p. (NASA-CR—170237; JPL—9950-801). NTIS, PC A03/MF A01.

Ray tracing of the Jovian magnetosphere in the low frequency range (1+40 MHz) has resulted in a new understanding of the source mechanism for Io dependent decametric radiation (DAM). Our three dimensional ray tracing computer code has provided model DAM arcs at 10 deg. intervals of Io longitude source positions for the full 360 deg of Jovian system III longitude. In addition, particularly interesting arcs were singled out for detailed study and modelling. Dependent decametric radiation arcs are categorized according to curvature--the higher curvature arcs are apparently due to wave stimulation at a nonconstant wave normal angle, psi. The psi(f) relationship has a signature that is common to most of the higher curvature arcs. The low curvature arcs, on the other hand, are adequately modelled with a constant wave normal angle of close to 90 deg. These results imply that for higher curvature arcs observed for from Jupiter (to diminish spacecraft motion effects) the electrons providing the gyroemission are relativistically beamed.

57777 **(N—8324452) Coronal and chromospheric physics.** Jefferies, J.T.; Landman, D.A.; Orrall, F.Q. (Hawaii Univ., Honolulu (USA)). May 1983. 25p. (NASA-CR—170295). NTIS, PC A02/MF A01.

Achievements and completed results are discussed for investigations covering solar activity during the solar maximum mission and the solar maximum year, other studies of solar activity and variability, infrared and submillimeter photometry, solar-related atomic physics, coronal and transition region studies, prominence research chromospheric research in quiet and active regions, solar dynamics, eclipse studies, and polarimetry and magnetic field measurements. Contributions were also made in defining the photometric filterograph instrument for the solar optical telescope, designing the combined filter spectrograph, and in expressing the scientific aims and implementation of the solar corona diagnostic mission.

57778 **(N—8324453) Mass flow velocity distribution in the solar chromosphere. Final Report, 1 January 1980-31 September 1981.** Tripp, D.A. (Weber State Coll., Ogden, UT (USA)). Sep 1981. 14p. (NASA-CR—170744). NTIS, PC A02/MF A01.

A study of chromospheric lines (those of Si-II and Si-III) was made using the data from high resolution telescope and spectrograph (HRTS). The optically thick line profiles such as lambda 1206 due to Si-III and lambda 1265 and lambda 1533 due to Si-II were to be investigated in detail using the techniques of spectrum synthesis in an attempt to model the mass flow velocity distribution in the region of the solar atmosphere.

57779 **(N—8324454) Investigation of coronal active region loop structures using AS E rocket X-ray images. Final Report, 31 March 1982-31 March 1983.** Webb, D.F. (American Science and Engineering, Inc., Cambridge, MA). Apr 1983. 100p. (NASA-CR—170284). NTIS, PC A05/MF A01.

Simultaneous high spatial resolution observations at 6 cm in soft X-rays, in photospheric magnetograms, and in optical filtergrams were used to compare the most intense sources of centimetric emission in two active regions to coronal loops, sunspots, chromospheric structures, and photospheric magnetic fields. Results show that the majority of the bright microwave components are not associated with sunspots or X-ray emission. A nonthermal mechanism appears necessary to explain the brightest microwave components, discrete regions of continuous particle acceleration may be common in active regions. Studies of the plasma parameters of selected loops imply that the radio emission is consistent with gyro-resonance absorption at the third and fourth harmonic, at least from part of each loop. Results are presented for: (1) X-ray and microwave observations of active regions (2) comparison of coronal holes observed in soft X-rays and HeI 10830 A spectrosheliograms and (3) the reappearance of polar coronal holes and the evolution of the solar magnetic field.

57780 **(N—8324455) Hard X-ray burst spectrometer event listing 1980, 1981 and 1982.** Dennis, B.R.; Frost, K.J.; Orwig, L.E.; Kiplinger, A.; Dennis, H.E. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Mar 1983. 143p. (NASA-TM—84998). NTIS, PC A07/MF A01.

A comprehensive reference for the hard X-ray bursts detected with the Hard X-Ray Burst Spectrometer on the Solar Maximum Mission for the time of launch on February 14, 1980 to March 1983 is provided. Over 6300 X-ray events were detected in the energy range from 30 to approx 500 keV with the vast majority being solar flares. The listing includes the start time, peak time, duration and peak rate of each event.

57781 **(N—8324457) Berne solar observations. Solar data for July-December 1982.** Fuhrer, M.; Kaempfer, N.; Magun, A.; Schoehlin, W.; Staehli, M.; Wuelser, J.P. (Bern Univ. (Switzerland)). Jan 1983. 38p. (REPT—49). NTIS, PC A03/MF A01.

Solar flare observation data at H-alpha and solar radio observations are presented.

57782 **(N—8324463) Searches for gamma ray emission from radio pulsars.** Thompson, D.J.; Bertsch, D.L.; Hartman, R.C.; Hunter, S.D. (National Aeronautics and Space Administration, Greenbelt, MD (USA). Goddard Space Flight Center). Jan 1983. 20p. (NASA-TM—849700). NTIS, PC A02/MF A01.

Searches were made for pulsed high energy (E = 35 MeV) gamma radiation from 43 pulsars using the SAS-2 data base and radio parameters. No positive results were found, and the upper

limits are consistent with the concept that gamma ray production efficiency increases with increasing apparent age. Two limits suggest that efficiency cannot be a simple function of apparent age beyond 10,000,000 years.

57783 (N—8325630) **First detection of the ground state JK 1_0 going to 0_0 submillimeter transition of interstellar ammonia.** Keene, J.; Blake, G.A. (National Aeronautics and Space Administration, Moffett Field, CA (USA). Ames Research Center). May 1983. 18p. (NASA-TM—84359; A—9321). NTIS, PC A03/MF A01.

The JK 1_0 approaching 0_0 transition of ammonia at 572.5 GHz was detected in OMC-1 from NASA's Kuiper Airborne Observatory. The central velocity of the line (VLSR approximately 9 km/s) indicates that it originates in the molecular cloud material, not the hot core. The derived filling factor of approximately 0.09 in a 2' beam implies a source diameter of approximately 35 if it is a single clump. This clump area is much larger than that derived from observations of the sub 1 inversion transition. The larger optical depth in the 1_0 approaching 0_0 transition (75-350) can account for the increased source area and linewidth as compared with those seen in the 1_0 inversion transition.

57784 (N—8325634) **Research in particles and fields.** Vogt, R.E.; Buffington, A.; Davis, L. Jr.; Stone, E.C. (California Inst. of Tech., Pasadena (USA)). 1982. 28p. (NASA-CR—170335). NTIS, PC A03/MF A01.

Cosmic rays and astrophysical plasmas, NASA spacecraft experiment activities, and gamma rays are discussed.

57785 (N—8325640) **Turbulence in transient solar phenomena. Final Report, 1 January 1980-30 July 1982.** Cross, M. (Grambling State Univ., LA (USA)). 1982. 36p. (NASA-CR—170315). NTIS, PC A03/MF A01.

If theta dependence is kept in the Navier-Stokes equations for the solar wind, than a density enhancement will grow. This growth is followed in the nonlinear equations until a streamer is formed. Viscosity stops the streamer's growth when there is a large difference in speeds inside and outside of the streamer. Using classical fluid mechanics and a latitude dependent hydrodynamical model, it is shown that unmagnetized perturbed flow evolves into high and low density regions. The growth mechanisms for density enrichments are discussed along with a nonlinear solution for their large amplitude development. It was found that a higher Reynolds number is needed to start turbulence in the presence of a magnetic field because energy is required to bend the field lines attached to the fluid. If cosmological gas was turbulent shortly after the big bang, then galaxies could have been formed by turbulent eddies.

57786 (N—8325641) **Turbulence and wave particle interactions in solar-terrestrial plasmas.** Dulk, G.A. (Colorado Univ., Boulder (USA)). 1982. 24p. (NASA-CR—170339). NTIS, PC A02/MF A01.

Theoretical modelling of two dimensional compressible convection in the Sun shows that convective flows can extend over many pressure scale heights without the nonlinear motions becoming supersonic, and that compressional work arising from pressure fluctuations can be comparable to that by buoyancy forces. These results are contrary to what was supposed in prevailing mixing length models for solar convection, and they imply a much greater degree of organized flow extending over the full depth of the convection zone. The nonlinear penetration of motions into the stable region below the convection zone was emphasized. These compressible flows are dominated by downward directed plumes in the unstable zone. Their strong penetration into the region of stable stratification below excites a broad spectrum of internal gravity waves there, and these in turn feed back upon the convection in the unstable zone to produce a rich time dependence.

57787 (N—8325645) **Structure of the heliospheric current sheet, 1978-1982.** Hoeksema, J.T.; Wilcox, J.M.; Scherrer, P.H. (Stanford Univ., CA (USA)). Apr 1983. 25p. (NASA-CR—170307). NTIS, PC A02/MF A01.

The structure of the heliospheric magnetic field changes substantially during the 11 year sunspot cycle. Its configuration for the period 1976 through 1982 using a potential field model was calculated. The structure during the rising phase, maximum, and early decline of sunspot cycle 21, from 1978 to 1982 is considered.

57788 (N—8325646) **Pinhole/Occulter Facility.** Tandberg-Hanssen, E.A.; Hudson, H.S. (National Aeronautics and Space Administration, Huntsville, AL (USA). George C. Marshall Space Flight Center). Apr 1983. 55p. (NASA-TP—2168). NTIS, PC A04/MF A01.

Scientific objectives and requirements are discussed for solar X-ray observations, coronagraph observations, studies of coronal particle acceleration, and cosmic X-ray observations. Improved sensitivity and resolution can be provided for these studies using the pinhole/occulter facility which consists of a self-deployed boom of 50 m length separating an occulter plane from a detector plane. The X-ray detectors and coronagraphic optics mounted on the detector plane are analogous to the focal plane instrumentation of an ordinary telescope except that they use the occulter only for providing a shadow pattern. The occulter plane is passive and has no electrical interface with the rest of the facility.

57789 (UCRL—89862) **Physics of the synchrotron model of cosmic gamma-ray bursts.** Liang, E.P. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1983. Contract W-7405-ENG-48. 10p. (CONF-830797—3). NTIS, PC A02/MF A01. Order Number DE84000917.

From Workshop on high energy transients; Santa Cruz, CA, USA (11 Jul 1983).

We review the theoretical arguments leading to the thermal synchrotron model of cosmic gamma-ray bursts. We propose a magnetic flare-resonant absorption mechanism for the production of the hot electrons that can account for most of the unusual properties of the emission layer.

57790 **Neutral hydrogen observations of binary galaxies.** van Moorsel, G.A. Groningen, Netherlands; Rijsuniversiteit Groningen (1982). 195p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (NL).

The present investigation concerns a detailed neutral hydrogen study of a carefully selected sample of 16 double spiral galaxies with the Westerbork Synthesis Radio Telescope (WSRT). The observational data provide useful material for a number of questions concerning the dynamics of double galaxies, in particular the question of the mass distribution. In Chapter 2 the criteria used to select a sample of double galaxies for observation with the WSRT are discussed. Observing techniques and the reduction of the data using the GIPSY system are described in Chapter 3. Chapters 4 through 7 contain the observational results. In Chapter 8 the method of analysis is described. Masses for the individual galaxies derived from rotation curves are compared with the "total" masses estimated from the orbital motion. In this fashion a direct estimate of the amount of dark matter is obtained that avoids the use of mean M/L values. In Chapter 9 a mass estimator for groups is developed in a way analogous to the binary galaxy mass estimator described in Chapter 8. The question of selection effects and the bias of the mass estimator for the point mass model are discussed extensively in Chapter 10. The final results are discussed in Chapter 11. It is shown that the orbital mass exceeds the sum of the individual masses by a large factor for several pairs, indicating either that there is a large amount of dark matter or that something is amiss with the concept of a physical pair.

57791 **Origin and evolution of extragalactic radio sources.** Jenkins, C.J. Cambridge, England; Cambridge University ([nd]). 364p. Available from British Library, Boston Spa, Wetherby, West Yorks. No. D41058/82.

This dissertation describes high-resolution observations of some 100 extragalactic radio sources made using the Cambridge 5-km radio telescope operating at a frequency of 5GHz. These observations when combined with previous results provide data for a complete sample of radio sources selected from the 3 CR catalogue. These data are then statistically analysed in an attempt to deduce any relationships between the various properties of radio sources.

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REFER ALSO TO CITATION(S) 57421, 57549, 57958

57792 **(DOE/ER/10578—T3) Laser-induced fluorescence line narrowing in atomic vapors.** Meier, T.; Schuessler, H.A. (Texas A and M Univ., College Station (USA). Dept. of Physics). 1983. Contract AS05-80ER10578. 12p. NTIS, PC A02/MF A01. Order Number DE83018216.

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The use of highly monochromatic light allows the selective excitation of atoms in vapors if excitation and detection of the fluorescence is carried out collinearly. The atoms capable of absorbing light then form an atomic beam of well defined velocity along the direction of the laser beam, but no velocity selection occurs perpendicular to it. The potential of the technique for Doppler-free atomic spectroscopy and for the study of excited atom collisions is demonstrated using the Na D_1 line as an example.

57793 **(DOE/EV/04361—T4) Raman and fluorescent scattering by molecules embedded in small particles.** Chew, H.W.; McNulty, P.J. (Clarkson Coll. of Tech., Potsdam, NY (USA). Dept. of Physics). 15 Oct 1983. Contract AC02-77EV04361. 22p. NTIS, PC A02/MF A01. Order Number DE84001278.

We have formulated a model for fluorescent and Raman scattering by molecules embedded in or in the vicinity of small particles. The model takes into account the size, shape, refractive index, and morphology of the host particles. Analytic and numerical results have been obtained for spherical (one and more layers, including magnetic dipole transitions) cylindrical and spheroidal particles. Particular attention has been given to the spherical case with fluoreacent/Raman scatterers uniformly distributed in the particles radiating both coherently and incohorently. Depolarization effects have been studied with suitable averaging process, and good agreement with experiment has been obtained. Analytic and numerical results have been obtained for the elastic scattering of evanescent waves; these results are useful for the study of fluorescent under excitation by evanescent waves.

57794 **(INIS-mf—8538) Anisotropy in electron-atom collisions. A study of the alignment and orientation of helium states excited by electron impact.** Linden van den Heuvel, H.B. van. (Rijksuniversiteit Utrecht (Netherlands)). 18 Oct 1982. 96p. NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703576.

Includes Dutch summary and previously published material; 65 refs.

Most of the work described in this thesis deals with studies using coincidence experiments, particularly for investigating the electron impact excitation of the 2^1P and 3^1D states in helium. A peculiarity is that in the 3^1D studies the directly emitted $3^1D \rightarrow 2^1P$ photons are not observed but the $2^1P \rightarrow 1^1S$ photons resulting from the $3^1D \rightarrow 2^1P \rightarrow 1^1S$ cascade instead. Another interesting point is the choice of the quantisation axis. The author demonstrates that it is of great advantage to take the quantisation axis perpendicular to the scattering plane rather than in the direction of the incident beam, as was done (on historical grounds) in previously reported electron-photon coincidence experiments. Contrary to the incident beam direction the axis perpendicular to the scattering plane really represents an axis of symmetry in the coincidence experiment. In Chapter II the so-called 'parity unfavoured' excitation of the $(2p^2)^3P$ state of helium by electrons is studied. In chapter III the anisotropy parameters for the electron impact excitation of the 2^1P state of helium in the energy range from 26.6 to 40 eV and in the angular range from 30° to 110° are determined. Chapter IV contains a description of a scattered electron cascaded-photon coincidence experiment on the electron impact excitation of helium's 3^1D state. The measurement of complex scattering amplitudes for electron impact excitation of the 3^1D and 3^1P states of helium is discussed in Chapter V.

57795 **(INIS-mf—8539) Stabilization of atomic hydrogen and deuterium.** Walraven, J.T.M. (Amsterdam Univ. (Netherlands)). 1 Sep 1982. 141p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703577.

Includes Dutch summary; includes previously published material; 157 refs.

This thesis deals with the first of a series of experiments done at the University of Amsterdam to study the properties of spin polarized atomic hydrogen (spa H) and deuterium (spa D) at very low temperatures (T approximately 0.3 K) and in high magnetic fields (B approximately 10 T). The experiments show that spa H and spa D may be subjected to experimental investigation like any normal (i.e. stable) gas. Chapter 2 deals with the experimental apparatus and in particular the development of a reliable method to cool atomic hydrogen to very low temperatures which turned out to be decisive for the experiments. An account of the first experiments with spa H can be found in chapter 3. These experiments showed that spa H can be stabilized for extended periods of time (at low temperature and in high magnetic fields) by covering all surfaces with a superfluid film of ^4He. The gas was detected by triggering recombination by locally breaking the helium film and measuring the heat of recombination. This method turned out to be very sensitive and easy to implement. In chapter 4 the physical picture of the gas is discussed. This includes a discussion of the density profile and the phenomenon of thermal leakage from the open structured sample cell. The density profile may be used to detect Bose-Einstein condensation. A second series of experiments is discussed in chapter 5. These measurements were aimed at achieving high densities and to study the limiting processes. They demonstrate that spa H behaves as a gas. Recombination measurements with spa D at low temperatures are discussed in chapter 6 and show that recombination predominantly occurs on the surface of the helium film.

57796 **(INIS-mf—8541) Lifetime measurements of the rare earths. A study on excited configurations.** Stahnke, H.J. (Kiel Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 1981. 103p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703578.

The lifetime of excited energy levels of Praseodymium, Neodymium, Gadolinium, Holmium and Erbium are measured. The measurements were done on atomic beams excited by laser radiation. The experimental results allow an interpretation of the electronic structure of the rare earths.

57797 (INIS-mf—8560, pp vp) **Deformation of energy spectra of ^3He and ^4He ions in energy range about 1 MeV/nucleon.** Slivka, M. (Slovenska Akademia Vied, Kosice (Czechoslovakia). Ustav Experimentalnej Fyziky). 1981. (In Slovak). NTIS (US Sales Only), PC A03/MF A01. (CONF-8108164—Pt.1-Vol.2).

From 7. conference of Czechoslovak physicists; Prague, Czechoslovakia (24 Aug 1981).

Published in summary form only.

57798 **(LBL—16509) Symposium on atomic spectroscopy (SAS-83): abstracts and program.** (Lawrence Berkeley Lab., CA (USA)). Sep 1983. Contract AC03-76SF00098. 130p. (CONF-830936—Absts.). NTIS, PC A07/MF A01. Order Number DE84001047.

From Symposium on atomic spectroscopy (SAS-83); Berkeley, CA, USA (12 Sep 1983).

Abstracts of papers given at the symposium are presented. Session topics include: Rydbergs, optical radiators, and planetary atoms; highly ionized atoms; ultraviolet radiation; theory, ion traps, and laser cooling; beam foil; and astronomy. (GHT)

57799 **(SAND—83-0629C) Theoretical treatment of the current neutralization of high intensity light ion beams in argon.** Swegle, J.A.; Slutz, S.A.; Johnson, D.J. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 1983p. (CONF-830911—13). NTIS, PC A02/MF A01. Order Number DE84000118.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

We have modeled the current neutralization of intense light ion beams propagating through low pressure argon gas in the drift region of the applied-B radial ion diode. Our description of the current neutralization process results in a set of equations, each having

the form of a system with an intrinsic magnetic decay time constant and driven by the time derivative of the beam current. The time constant is proportional to the gas electrical conductivity, for which we employ a time dependent model. Comparing our calculations to experiments, we find that our computations duplicate the qualitative behavior of the system in portions of the drift region free of applied magnetic fields; however, in regions with strong applied fields, we underpredict the degree of current neutralization found experimentally. The addition of carbon ions to the beam model improves the neutralization.

57800 **(SAND—83-1918C) Threshold electron excitation of Auger-electron and x-ray emissions in La.** Chamberlain, M.B.; Burr, A.F.; Liefeld, R.J. (Sandia National Labs., Albuquerque, NM (USA); New Mexico State Univ., Las Cruces (USA)). 1983. Contract AC04-76DP00789. 18p. (CONF-831171—6). NTIS, PC A02/MF A01. Order Number DE84000946.

From American Vacuum Society meeting; Boston, MA, USA (1 Nov 1983).

The intensities of the M_5O_3 and M_5N_3 characteristic X-ray lines and the $M_5N_{4,5}N_{4,5}$ Auger-electron line from La were measured as functions of the electron excitation energy near the M_5 ionization energy. The excitation curve of each of these emissions contains a line-like structure a few eV above the threshold. The full width at half maximum (3.0 +- 0.2 eV) and relative height (4x) of this structure are the same in these three excitation curves; however, they are different than the respective values (2.3 +- 0.2 eV and 200x) we previously measured for a resonant bremsstrahlung emission observed when the electron excitation energy was near the M_5 ionization energy. These results support our earlier proposal that two distinct states are excited for near threshold, electron excitation of the La M_5 level: the $3d^9\,4f^0$ state which decays via the M_5 series characteristic X-ray and Auger-electron emissions, and the $3d^9\,4f^2$ intermediate bound state which appears to decay by only a single channel - the emission of a resonant X ray with a photon energy of 832 +- 1 eV. These results may be evidence of a closed channel resonance in the electron scattering cross section in solid La, similar to resonances found in Ne gas.

57801 **(SAND—83-2094C) Quantitative determination of the intensities of known components in spectra obtained from surface analytical techniques.** Nelson, G.C. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 22p. (CONF-831011—2). NTIS, PC A02/MF A01. Order Number DE84000926.

From American Vacuum Society symposium; Boston, MA, USA (31 Oct 1983).

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Linear least squares methods have been used to quantitatively decompose experimental data obtained from surface analytical techniques into its separate components. The mathematical procedure for accomplishing this is described and examples are given of the use of this method with data obtained from Auger Electron Spectroscopy (both N(E) and derivative), X-ray Photoelectron Spectroscopy, and Low-Energy Ion Scattering Spectroscopy. The requirements on the quality of the data are discussed.

57802 **Rotational transfer rates and propensity rule in nitric oxide-rare gas collisions.** Smith, A.U.; Johnson, A.W. (Sandia National Lab., Albuquerque, NM). *Chemical Physics Letters;* 93: No. 6, 608-612(24 Dec 1982).

In the first application of the technique of multistep ionization to the measurement of rotational transfer rates within an electronically excited molecular state, we have observed a propensity to even ΔJ in NO colliding with rare gases and have measured a number of transfer rates with high accuracy. A propensity to even ΔJ has been predicted but no observation of it has been previously reported.

57803 **Studies of clusters in the gas phase and application to an understanding of transitions from the gaseous to the surface and condensed state.** Castleman, A.W. Jr. (Colorado Univ., Boulder, Dept. of Chemistry). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Studies of the structure, stability, electronic properties, and formation kinetics of small clusters provide information useful in furthering understanding of nucleation processes, liquid state properties, and the nature of surfaces. Using mass spectrometric coupled with various high pressure ion clustering and Stark effect-molecular beam techniques, the details of the primary clustering steps leading to the nucleation of bulk liquid from the vapor are obtained by direct observation. This paper is devoted to a review of some of our recent results on these subjects.

57804 **Cluster properties studied by electron impact ionization.** Maerk, T.D.; Stephan, K.; Castleman, A.W. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. fuer Kernphysik und Gaselektronik); Helm, H. (SRI International, Menlo Park, CA (USA). Molecular Physics Lab.); Futrell, J.H. (Utah Univ., Salt Lake City (USA). Dept. of Chemistry); Maerk, E. (Hoehere Technische Bundeslehr- u. Versuchsanstalt, Innsbruck (Austria)); Peterson, K.I. (Colorado Univ., Boulder (USA). Dept. of Chemistry); Djuric, N. (Belgrade Univ. (Yugoslavia). Inst. za Fiziku); Stamatovic, A. (PMF Kragujevac (Yugolavia)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Experimental studies of the properties of atomic and molecular clusters, including investigations of the dynamics of their formation and mechanisms of ionization and dissociation are in progress in our laboratory. Results of electron impact-supersonic beam ionization experiments utilizing a double focussing mass spectrometer are briefly reviewed.

57805 **Charged water- and CO_2-clusters.** Armbruster, M.; Haberland, H.; Schindler, H.G. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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A supersonic molecular beam source with an internal radioactive β-emitter produces a variety of unusual positively or negatively charged cluster ions, among them the so called 'hydrated' electrons $(H_2O)sup(-n)$, with $n>=8$[1]. For a CO_2-expansion the metastable ion CO^-_2 is observed.

57806 **Recent experiments on the excitation and decay of small molecular ions.** Govers, T.R. (Laboratoire pour l'Utilisation du Rayonnement Electromagnetique (LURE), Paris-11 Univ., 91 - Orsay (France)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Molecular photoionisation studies carried out a Orsay by means of synchrotron radiation are examplified by two recent experiments: photoelectron spectroscopy dealing with vibrational au-

toinisation in H_2, and threshold photoelectron/photoion coincidence studies on the unimolecular dissociation of NO^+ between 20.11 and 24.59eV.

57807 **Unimolecular and collision induced dissociation of Ar, N_2 and ArN_2 cluster ions.** Stephan, K.; Maerk, T.D. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The inflight decomposition (unimolecular and collision induced dissociation) of (Arsub(x) Nsub(2y)) cluster ions was studied quantitatively using a double focussing mass-spectrometer (reversed geometry). The metastable ionic states are produced by single impact of 70 eV electrons on neutral van der Waals molecules formed in a supersonic expansion of a Ar-N_2 mixture seeded with helium. In addition, this contribution gives a first report on the dependence of metastable dissociation rates of cluster ions on the stagnation gas temperature prior to expansion.

57808 **(e,2e) experiments on He at intermediate energy (400-1600 eV).** Giardini-Guidoni, A.; Fantoni, R. (Comitato Nazionale Energia Nucleare, Rom (Italy). Lab. Spettroscopia Molecolare); Rosi, M.; Zecca, A. (Perugia Univ. (Italy)); Camilloni, R.; Stefani, G. (Istituto Metodologie Avanzate Inorganiche, C.N.R., Area di Ricerca di Roma, Monterotondo, Rome (Italy).). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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In this paper information on ionization theories obtainable in dypole and binary (e,2e) experiments is discussed. Some data taken in asymmetric kinematics on He are presented.

57809 **Deviation of cracking patterns and their influence on RGA-accuracy.** Breth, A.; Dobrozemsky, R. (Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H. Physik-Inst.:. pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Even with the ion-source parameters kept constant we could demonstrate that the cracking patterns of some gases may change more than tolerable. Consequently, a defolding of mass spectra from mixtures of gases interfering at same mass numbers (like CO, CO_2, CH_4) could be rather difficult and special care has to be taken in the evaluation of results.

57810 **Photodetachment of electrons from negative ions.** Peterson, J.R. (SRI International, Menlo Park, CA). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The general characteristics of photodetachment will be reviewed, and examples that illustrate various details of this process that is related to electron scattering will be given. Some recent developments will be discussed in detail.

57811 **Photon's view of resonances in low-energy ion-atom collisions.** Helm, H. (SRI International, Menlo Park, CA (USA)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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In this paper we discuss the use of optical techniques for the high-resolution study of low-energy ion-atom interactions in half-collision experiments. Optical selection rules allow the precise preparation of a collision complex at well defined energy and in well defined quantum numbers and the observation of its dynamic properties. Hence the very finest details of molecular interactions and their role in reactive encounters can be uncovered. As a result an ion-atom collision is experimentally decomposed into individual partial wave contributions. Their assignment and interpretation afford a decisive challenge to the experimenter and to the theory of ion-atom interactions.

57812 **Investigation of ion molecule collisions by spectroscopic techniques.** Ding, A.; Richter, K.; Steinmetzger, U. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Strahlenchemie). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Only recently has the investigation of spectroscopic techniques become feasible by the advent of more sopisticated and highly sensitive methods. The main obstacle against an application to ionic species is the existence of space charge, which severely limits the ion densities obtainable. Several ways of approach have been used to overcome these problems. This review will deal with the two aspects: the investigation of the internal state distribution of molecular ions by the methods of infrared emission spectroscopy and laser induced fluorescence.

57813 **Progress report on recent spectroscopic and laser relevant investigations.** Howorka, F.; Kuen, I.; Federer, W. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik); Jelenkovic, B. (Belgrade Univ. (Yugoslavia). Inst. za Fiziku); Futrell, J.H. (Utah Univ., Salt Lake City (USA). Dept. of Chemistry); Rozsa, K. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics); Ding, A. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)); Varney, R.N. (Palo Alto (USA)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Spectroscopic and laser relevant investigations comprised three main topics: 1. Study of the luminescence arising from the interaction of ions with atoms and molecules, and of atoms sputtered from a solid target. 2. Combined mass spectrometric and light spectroscopic space resolved studies of the excitation of radiative levels of various charge states in a hollow cathode discharge operated in a variety of discharge gases and mixtures. 3. Study of the influence of the addition of foreign atoms and molecules on the characteristics of a He-Ne laser.

57814 **Behaviour of a model atom in a uniform magnetic and a laser field.** Bergou, J. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics:; Ehlotzky, J. (Innsbruck Univ. (Austria). Inst. fuer Theoretische Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The three-dimensional anisotropic charged harmonic oscillator in an uniform magnetic and in a laser field turns out to be an exactly soluble quantum-mechanical problem. The solution is obtained here for the first time and is derived in a purely algebraic manner. The transition from the atomic spectrum to Landau type spectrum, the effect of the laser field as well as possible resonances are discussed in some detail.

57815 **Basic microscopic theory of chemical reactions in dense gases.** Flannery, M.R. (Georgia Inst. of Tech., Atlanta (USA). School of Physics). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The first basic theory of ion-ion recombination in a dense gas is outlined. The rate of the process is shown to be determined by the completion between transport and reaction. The theory provides as a function of gas density, ion-density and time. Results are provided for the rate of homogeneous recombination of (Kr^+ - F^-) and (Xe^+ - Cl^-) systems in rare gases. Time dependent rates are provided and interesting insights emerge. Geminate recombination is also discussed.

57816 **Determination of the complete density matrix of He I 3P after He^+ - Ne collisions with impact parameter selection.** Winter, H. (Freie Univ. Berlin (Germany, F.R.). Fachbereich Physik); Andrae, H.J. (Muenster Univ. (Germany, F.R.). Inst. fuer Kernphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Applying a 'quasi-coincidence' method we determine the density matrix components of HeI 3p exited by He^+ - Ne collisions with impact parameter selection at energies from 2.3 to 20 keV.

57817 **Some 'simple' ion-molecule reactions measured with guided beams.** Schlier, Ch. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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After a short look on RF-ion optics and its use in a 'guided beam' tandem mass spectrometer, we discuss experiments and theoretical evidence for reaction mechanisms in the ion-molecule system: N^+ +CO resp. C^+ + NO, and D^+_3 + H_2.

57818 **Ion-molecule reaction dynamics: Its development in fifteen years.** Zdenek, H. (Ceskoslovenska Akademie Ved, Prague. Ustav Fyzikalni Chemie a Elektrochemie J. Heyrovskeho:. pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The development of the field of the dynamics of ion-molecule reactions is reviewed and its achievement are illustrated by examples of specific studies.

57819 **Recent developments in the investigation of the energy dependences of ion-neutral-reactions in drift experiments.** Lindinger, W.; Villinger, H.; Howorka, F.; Saxer, A.; Dobler, W.; Niccolini, St.; Richter, R.; Ramler, H. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The combination of slow- and fast-flow-drift-tubes with selective ion injection systems has led to a tremendous increase in the information on ion neutral interactions in the low energy regime (room temperature to a few eV). In the present progress report examples are shown of recent results on the energy dependences of branching ratios, of the state distribution of ionic reaction products, on the influence of the ionic excitation, on the reactivities of ions with neutrals and on the investigation of associative reactions in drift tubes.

57820 **Ion mobilities and ion-atom interaction potentials.** Gatland, I.R. (Georgia Inst. of Tech., Atlanta (USA). School of Physics). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The techniques for measuring the mobilities of ions in gases, relating interaction potentials to mobilities, and determining potentials from experimental mobilities are reviewed. Applications are presented for positive alkali ions and negative halogen ions in inert gases.

57821 **Collisions of Rydberg atoms.** Gounand, F. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Atomique). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Some general aspects of collisions involving Rydberg atoms are presented. Two specific examples that display in a clear fashion some of the most interesting features of the processes are more extensively described.

57822 **Ionization by excited rare gas atoms of short lifetime.** Pesnelle, A. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Service de Physique Atomique). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Interaction between radiative excited rare gas atoms of low n ground state atoms or molecules has been studied either in discharges or in crossed beam experiments. Results of recent work on Hesup(*)-rare gas systems and their comparison with the existing theoretical prediction are discussed.

57823 Excitation cross section variations with energy and their explanation in a Landau-Zener model studied in He^+ - Ar and Ar^+ -He encounters. Federer, W.; Kuen, I.; Howorka, F. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik); Jelenkovic, B. (Belgrade Univ. (Yugoslavia). Inst. za Fiziku); Ding, A. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.)); Varney, R.N. (Maybell Way, Palo Alto (USA)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The excitation of radiative levels in Ar^+ by He^+ -Ar and Ar^+ -He encounters is studied by a beam-gas cell apparatus in the energy range 1 - 4200 eV lab. The study is confined to the wavelength interval 200 - 900 nm. The spectra obtained consist in both cases of Ar II line emissions which can be assigned to known excited states in Ar^+.

57824 Coherent anti-Stokes Raman spectroscopy (CARS) in a pulsed molecular beam. Byer, R.L. (Stanford Univ., CA (USA)); Duncan, M.D. (Naval Research Lab., Washington, DC (USA)); Koenig, F. (Heidelberg Univ. (Germany, F.R.). Physikalisches Inst.); Oesterlin, P. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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CARS spectra of C_2H_2 were taken in a pulsed molecular beam at various distances from the nozzle. Measurements of the rotational temperature show the cooling of the gas due to the expansion. Measured temperatures are always higher than calculated. A possible explanation for this discrepancy is condensation in the beam. For molecules with a complicated rotational spectrum as C_2H_4 the cooling in the beam reduces the number of lines drastically, which can simplify the analysis of data..

57825 Vacuum ultraviolet spectroscopy of hollow cathode discharges. Kuen, I.; Howorka, F. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. Spektroskopie und Laserphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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A radially moveable hollow cathode discharge was used to determine the light intensity distribution of atomic and ionic resonance lines in a discharge in He, Ne, Ar, Kr, Xe, H_2, O_2, N_2 and He-Xe in the wavelength region 30 - 160 nm. A narrow collimator was attached to the anode end of the discharge thus allowing the measurement of the line intensity distribution with a radial resolution of 0.1 mm. A 0.2 m VUV monochromator with a holograhic, osmium coated grating blazed for 121.6 nm was used, with an open 17-stage multiplier as a detector. The monochromator was differentially pumped by a turbomolecular pump.

57826 Time scales in ion-molecule scattering. Lindner, F. (Kaiserslautern Univ. (Germany, F.R.). Fachbereich Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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On the basis of different time scales, we will discuss some recent experiments where the dynamical behaviour of the collision systems with respect to time effects manifests itself in a quite explicit way. Most examples are taken from ion-molecule scattering, since here we have the well-known advantage (as opposed to neutral systems) that the collision energy is varied quite easily which allows to tune the collision time versus the different eigentimes of the system.

57827 State-selective electron capture studied for quasi-one-electron collision systems. Winter, H. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Recent theoretical and experimental work on state-selective electron capture in collisions of singly and doubly charged ions with Li atoms is reviewed. Such studies are also well suited to check theoretical predictions on electron capture into multiply charged ions from H(1s) atoms. Two recently proposed direct applications for diagnostics of thermonuclear fusion plasmas are discribed, too.

57828 Absolute initial-to-final state-selective one-electron capture cross sections for Ne^{+2}-Xe collisions. Brazuk, A.; Winter, H. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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An optical attenuation technique adapted for the vuv spectral region was used to determine total one-electron capture cross sections for collisions of ground state and metastable doubly charged Neon ions with Xe atoms at 40 keV impact energy. The cross sections turned out to be considerably different which can be explained by larger probability for transfer ionization for the metastable primary ions. The fractions of both ion states have been derived and used to determine initial-to-final state-selective one-electron capture cross sections for production of several NeII states.

57829 Proton transfer and isotopic exchange reactions. Villinger, H.; Howorka, F.; Saxer, A.; Richter, R.; Lindinger, W. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. Atom- und Molekuelphysik); Futrell, J.H. (Utah Univ., Salt Lake City (USA). Dept. of Chemistry); Henchman, M.J. (Bureau of Commercial Fisheries, Ann Arbor, MI (USA)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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The energy dependences of the exothermic proton transfer from ArH^+ to various neutrals has been investigated in the energy regime from thermal to approximately 1 eV. All rate coefficients obtained are fast (within a factor of two of the Langevin of ADO limiting values) and show only slight energy dependences. From the equilibrium $[Ar\ H^+] / [H_3^+]$ in Ar-H_2 mixtures a difference of the proton affinities between Ar and H_2 of $\Delta Pa = 0.55$ eV is obtained. The exchange reactions $H^+ + D_2 \rightarrow HD + D^+$ and $D^+ + H_2 \rightarrow HD + H^+$ show energy dependences which are in full agreement with theoretical predictions taking into account statistical factors and the energetics of the reactions.

57830 Thermal energy charge transfer reactions: Kinetic and internal energy of the products. Derai, R.; Mauclaire, G.; Marx, R. (Paris-11 Univ., 91 - Orsay (France)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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Non dissociative charge transfer reactions from the ²Psub(3/2) ground state of Ar^+, Kr^+ and Xe^+ with several small molecules have been investigated at near thermal energy. In most of these systems, a substantial kinetic energy release is observed; its measurement allows determination of the internal energy of the products. It is shown that molecular products are usually formed in high vibrational levels of the electronic ground state with a rather narrow vibrational distribution.

57831 Selected ion flow tube investigation on the quenching of N_2i (v not= o) by various neutrals. Dobler, W.; Howorka, F.; Lindinger, W. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

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A newly built Selected Ion Flow Tube (SIFT) was used to determine rate coefficients for the quenching of the vibration of N_2^+ (v not= o) by Ne, O_2, N_2, NO and CO_2 for which values of 0.045; 1.2; 5; <= 0.3 and < 1 (all in units of 10^{-10} cm^3 sec^{-1}) were obtained.

57832 Kinetic energy dependences of the branching ratios of the reactions He^+, Ne^+ and $Ar^+ + H_2O$. Dobler, W.; Lindinger, W.; Howorka, F. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

In the present paper the Innsbruck selected-ion flow drift tube was used for measuring rate constants and product distributions. Mass selected ions are injected into a flow drift tube through a annular venturi inlet nozzle. Water vapour is added in the drift tube section of the apparatus and the resulting ion species are collected through a small hole in a nose cone by a second mass spectrometer.

57833 Lateral diffusion of mass identified ions: experimental. Sejkora, G.; Hilchenbach, M.; Maerk, T.D. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. fuer Kernphysik und Gaselektronik); Groessl, M. (Balzers A.G. fuer Hochvakuumtechnik und Duenne Schichten (Liechtenstein)); Helm, H. (SRI International, Menlo Park, CA (USA). Molecular Physics Lab.); Elford, M.T. (Australian National Univ., Canberra. Ion Diffusion Unit); Lindinger, W. (Innsbruck Univ. (Austria). Institut fuer Experimentalphysik, Abt. fuer Atom- und Molekuelphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

This contribution presents the design and construction of a new apparatus suitable for the quantitative study of lateral diffusion of mass identified ions. Previous studies and experimental techniques are reviewed and compared with the present system. In addition, properties of a new stable low-current ion source will be reported.

57834 Differential cross section for $Ne(^3P_0)$ and $Ne(^3P_2)$ scattered from ground state neon. Beyer, W.; Haberland, H.; Hausamann, D. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The differential elastic cross sections for electronically exited $Ne(^3P_0)$ and $Ne(^3P_2)$ from ground state neon atoms at thermal collision energies have been measured separately. Potentials for $Ne(^3P_0)+Ne$ could be determined and the height of the intermediate potential maxima for $Ne(^3P_2)+Ne$ could be estimated to 25 meV. By preparing $Ne(^3P_2)$ in special Msub(J) states scattering in single Ω molecular states could be observed.

57835 Collisional ionization of rubidium excited states. Cheret, M.; Barbier, L.; Deloche, R. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)); Lindinger, W. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

A mass analysis of ions formed in a Rb cell where 5p and more excited s or d states are created by lasers has shown that besides associative ionization by collision of the s or d level with a ground atom Penning ionization by collision between excited and 5p atoms play an important role.

57836 Excitation and polarization of projectiles in ion-beam surface interaction at grazing incidence. Andrae, H.J. (Muenster Univ. (Germany, F.R.). Inst. fuer Kernphysik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Published in summary form only.

After an introduction to the consequence of the fundamental principles of symmetry involved in the interaction of ions with atoms, tilted foils, and surfaces, a summary on the presently known experimental observations from ion-beams surface interaction at grazing incidence (IBSIGI) will be given together with models for their description - when available. As experimental evidence develops for the possibility to distinguish between the formation of the excited states and the post-formation interaction, relevant results will be discussed in terms of a post-formation interaction model. The dependence of the excitation and polarization on the surface material and structure (single crystals) will also be analyzed with this model. Further information on the interaction is being derived from applications of IBSIGI for the production of nuclear spin polarized ion beams.

57837 Towards a unified model for the formation of sputtered excited states. Kelly, R. (IBM Research Div., Yorktown Heights, NY). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The statistical model for the formation of sputtered excited states is most convincingly tested by comparing experiment with

theory for an ensemble of yields such as SiI, SiII, and SiIII, where the internal energies span a sufficiently wide interval. The electron-exchange model was previously tested by Veje in work where group II metals were bombarded in ultrahigh vacuum and the yields of excited ions were found to be unusually high relative to excited neutrals. It is argued that, with certain reservations, the two models may constitute limiting aspects of a single model which are valid, respectively, when electron exchange is forbidden or allowed.

57838 **Ion neutralization at surfaces.** Varga, P. (Vienna Univ. (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Some problems of the interaction of slow singly and multiply charged ions with surfaces are described; in particular the neutralization processes which happen a few Angstroms in front of the surface are studied. The stepwise neutralization in a sequence of Auger-de-excitation and Auger-neutralization processes for doubly charged neon ions is demonstrated in detail.

57839 **Measurement of metastable fractions in noble-gas ion beams.** Hofer, W.; Vanek, W.; Varga, P.; Winter, H. (Vienna Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

A method is presented to determine metastable fractions of singly charged ion beams from the measured secondary electron energy distribution following slow ion impact on a clean metal surface. The method is also capable to work with slightly contaminated surfaces, which is of interest for practical applications.

57840 **Ion-surface interactions at low energies.** Taglauer, E. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Ion-surface interactions in the low energy range (around 1 keV) can be understood to some extent using simple models such as single two-body collision processes or undisturbed electronic energy levels. More detailed investigations show that multiple collisions, shadowing and different neutralization processes for bulk and surface scattering have to be considered. For a complete description of the interaction a three dimensional treatment is necessary, including trajectory dependent neutralization.

57841 **Photon stimulated desorption revisited.** Menzel, D. (Muenchen Univ. (Germany,F.R.). Institut fuer Festkoerperphysik:. pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The progress made in the title subject in the last two years is reviewed. The main promise which has been discussed at SASP'80 - that the effect should be usable for a very surface-sensitive type of EXAFS - has been realized in one case. Improved understanding has been reached of the basic underlying mechanisms which shows that many-body effects can be of importance. Besides their intrinsic interest, these can lead to complications in the interpretation of such data.

57842 **Changes in the surface composition of TiC, TaC and WC under low energy ion bombardment.** Stoeri, H.; Betz, G.; Braun, P. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Changes in the surface composition of TiC, TaC and WC under 0.5 - 5 keV Ar ion bombardment have been studied by Auger Electron Spectroscopy (AES). For TaC and WC surface enrichment of Ta and W, resp., was observed, which increases with decreasing ion energy. In addition transients in surface composition are found whenever the ion energy is changed. This can be explained in terms of depth profiling of the altered layer. For TiC no preferential sputtering effects are observed, as is concluded from the absence of transients in surface composition when the ion energy is varied.

57843 **Mobilities of CH^+ sub(n) (n = 0,1,2,3) in He and of CH_3^+ in Ar.** Peska, K.; Sejkora, G.; Egger, F.; Ramler, H.; Kriegel, M.; Lindinger, W. (Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik); Stoeri, H. (Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

A slow-flow-drift tube, was adapted to allow for the measurements of ion mobilities by recording the arrival time spectra of the ions, which are pulsed by two separate grids. Results on the E/N dependences of the reduced mobilities μ_0 of CHsub(n)$^+$ (n = 0,1,2,3) in He and of CH_3^+ in Ar are presented.

57844 **Various probes of configuration interaction in barium Rydberg states.** Gallagher, T.F. (SRI International, Menlo Park, CA (USA). Molecular Physics Lab.); Sandner, W. (Freiburg Univ. (Germany, F.R.). Fakultaet fuer Physik); Safinya, K.A. (Schlumberger Technology Corp., New York (USA)); Gounand, F. (CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Apart from the common MQDT analysis of level energies, we present various independent methods of determining the composition of configuration mixed wave functions in bound and autoionizing Rydberg states.

57845 **Molecular dynamics study of the collision induced dissociation reactions of CH_4i and $C_6H_6^+$ at electron volt collision energies.** Futrell, J.H. (Utah Univ., Salt Lake City (USA). Dept. of Chemistry); Herman, Z.; Friedrich, B. (Heyrovsky Institute of Physical Chemistry and Electrochemistry CSAV, Prag (Czechoslovakia)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

A limited resolution preliminary study of the scattering of CH_4^+ and $C_2H_5^+$ from rare gas atom targets suggests the following general features: (1) A two-step mechanism of bimolecular excitation accompanied by relatively slower unimolecular dissociation is followed at very low collision energies (to 1 eV CM). (2) Threshold energies for CID may be measured quite accurately. (3) Extensive angular scattering is observed. (4) Translational endoergicity correlates approximately linearly with scattering angle in C.O.M. coordinates, providing a basis for deducing breakdown graphs for complex ions.

57846 **Metastable transitions as an evidence for several ion-molecule reactions in SO_2 at low pressure.** Stamatovic, A. (PMF Kragujevac (Yugoslavia)); Miletic, M. (IBK - Vinca, Belgrad (Yugoslavia)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Metastable transitions have been observed as Aston's peaks in the negative ion mass spectrum of SO_2 (Ee=5eV, p=0,1 - 1 Pa). Studies of temperature, pressure and electron energy dependences, within the limits of used apparata, have given some more information about quite a number of ion-molecule reactions in SO_2 at low pressures, but has not resolved all of ambiguities about the origin and dissociation of negative ions with mass numbers greather than mass number of the molecular negative ion, SO_2^-.

57847 **Yield of metastable nitrogen atom in dissociative recombination of N^+Z ions.** Queffelec, J.L. (Department de Physique Atomique et Moleculaire (France)); Rowe, B. (Laboratoire d'Aerothermique de C.N.R.S., Meudon (France)); Morlais, M. (Rennes-1 Univ., 35 (France)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The branching ratio of $N(^2D)$ and $N(^2P)$ atoms formed in the reaction $N^+_2 + e \rightarrow N + N$ was studied using absorption technics. N^+_2 was formed by charge exchange with Ar^+ ions in an argon plasma jet. It was shown that $N(^2D)$ is one of the major products of the dissociative recombination.

57848 **Study of rare-gas dimer ions by the variational cellular method.** Wentzcovitch, R.M.M. Sao Paulo, Brazil; Instituto de Pesquisas Energeticas e Nucleares (1982). 90p. (In Portuguese). Available from IPEN, Sao Paulo, Brazil.

The Variational Cellular Method to study ionized molecules in their ground and excited states with the scope of testing the validity of such method in these cases have been used. The ions studied are Ne^+_2, Ar^+_2, where the latter is the system with the largest number of electrons tested by VCM so far. The electronic transitions in these systems are important mechanisms of efficiency decay for the noble gas halide lasers ('excimer lasers').

57849 **Analysis of particle atom collision processes, using polarized beams.** Khalid, S.M. Stirling, England; Stirling University (1981). 134p. Available from British Library, Boston Spa, Wetherby, West Yorks. No. D42690/82.

Theory of measurement for particle atom collision processes using polarized beams is presented. The density matrix formulism is applied to derive expressions for the Stokes parameters describing light emitted in particle photon coincidence experiments.

6404 Fluid Physics

57850 **(FRNC-TH—1131) Infrared problems in field perturbation theory.** David, F. (Paris-6 Univ., 75 (France)). Dec 1982. 224p. (In French). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83781085.

The work presented mainly covers questions related to the presence of infrared divergences in perturbation expansions of the Green functions of certain massless field theories. It is important to determine the mathematical status of perturbation expansions in field theory in order to define the region in which they are valid. Renormalization and the symmetry of a theory are important factors in infrared problems. The main object of this thesis resides in the mathematical techniques employed: integral representations of the Feynman amplitudes; methods for desingularization, regularization and dimensional renormalization. Nonlinear two dimensional space-time sigma models describing Goldstone's low energy boson dynamics associated with a breaking of continuous symmetry are studied. Random surface models are then investigated followed by infrared divergences in super-renormalizable theories. Finally, nonperturbation effects in massless theories are studied by expanding the two-dimensional nonlinear sigma model in 1/N.

57851 **(IFD—2/82) Theoretical studies on behaviour of particles at high velocities.** Sepulveda, C.F. (Technische Hochschule Darmstadt (Germany, F.R.). Inst. fuer Flugtechnik). 1982. 202p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751162.

With respect to the future use of the laser-stroboscopy-anemometer, developed at the Darmstadt Technical University to investigate two-dimensional flow fields in the high velocity range, a theoretical study of the behaviour of small particles is presented. Such particles may be used as flow velocity indicators. The equations of motion are given for three different flow types, the field of constant supersonic flow, an oblique compressive impact, and the relaxation of particles differing in shape Expansionsfaecher, size, and density is simulated and evaluated in different basic flow fields with various Csub(W)-dependencies.

57852 **(KFKI—1982-23) Pressure-drop measurements for water flow in ceramic channels.** Gyenes, G.Y.; Csom, V.; Windberg, P. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics). Apr 1982. 22p. (In Hungarian). NTIS (US Sales Only), PC A02/MF A01. Order Number DE84900038.

The experimental technique and results of measurements of pressure drop are reported for upward vertical flow of water in a special octagonal ceramics channel at a pressure of 1 MPa for mass flowrates ranging from 10 to - 22 m^3/h. The description of the test section and the method of the experiments are given in the paper. On the basis of the data measured the friction factors were calculated. The friction factors observed showed a good agreement with the calculation by the Ibragimov method.

57853 **(UCRL—89094) Further studies on equal-order interpolation for Navier-Stokes.** Gresho, P.M.; Lee, R.L.; Sani, R.L. (Lawrence Livermore National Lab., CA (USA); Colorado Univ., Boulder (USA)). Oct 1983. Contract W-7405-ENG-48. 7p. (CONF-830149—2). NTIS, PC A02/MF A01. Order Number DE84000916.

From 5. finite element methods in flow problems; Austin, TX, USA (23 Jan 1983).

The simplest quadrilateral element available for the incompressible Navier-Stokes equations is the mixed interpolation 4-node element with bilinear velocity and (piecewise) constant pressure - denoted herein by 4/1. The next simplest is the 4/4 element, in which (continuous) bilinear approximation is also employed for pressure - i.e., the simplest case of equal-order interpolation. The 4/4 element had been more or less rejected early-on, following the pioneering work of Hood and Taylor who first discovered that equal-order interpolation generated spurious pressures. The 4/1 element, on the other hand, has been very popular, even though it sometimes generates one spurious pressure mode (vs many for the 4/4 element) which is usually filterable. But the 4/1 element generates a poor approximation to (Del P) when distorted elements are employed (via the bilinear isoparametric technique), which often leads to large errors in velocity; e.g. this element generated wrong answers for vortex shedding on the same mesh for which a higher order element (9/4) performed well. Although the 4/4 element generates ostensibly useless pressures, the pressure gradient and the velocity field might be much more accurate than those from the 4/1 element, especially when distorted meshes are employed. Based on

these observations, we have successfully tested the 4/4 element on two problems, reported herein, for which the 4/1 element failed. The 4/4 element is no panacea, however; the multiple (and generally unknown) spurious pressure modes (pure and impure) associated with equal-order interpolation leads to a generally delicate solution procedure. After summarizing our experience in this regard, we will present a viable technique for recovering a useful pressure field from the otherwise polluted pressures.

6451 Particle Interactions And Properties - Experimental

REFER ALSO TO CITATION(S) 57870

57854 (BONN-HE—83-2) Recent results on two-photon physics from Tasso and a review of measurements of the two-photon total cross section. Kolanoski, H. (Bonn Univ. (Germany, F.R.)). Mar 1983. 44p. (CONF-821252—1). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751137.

From Seminar on /gamma gamma/-physics; Montpellier, France (9 Dec 1982).

Recent results on two-photon physics from the Tasso experiment are presented: the measurement of the two-photon production of Kanti K with the determination of the $\gamma\gamma$-width of the f'(1515), an analysis of the angular correlations in the reaction $\gamma\gamma$->rho^{0}rho^0->$\pi^+\pi^-\pi^+\pi^-$ and the observation of a narrow structure in the four pion mass spectrum around 2.1 GeV. In a separate part the experimental results on the total cross section for hadron production by two photons are reviewed.

57855 (DESY—83-017) Lepton pair production in deep inelastic e-γ scattering. D'Agostini, G.; Apel, W.D.; Banerjee, S.; Bodenkamp, J.; Engler, J.; Fluegge, G.; Fries, D.C.; Fues, W.; Gamerdinger, K.; Hopp, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 19p. (LAL—83-2). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751114.

CELLO Collaboration.

At PETRA we have measured the process e + γ -> e + l^+ + l^-, where l is either an electron or a muon, at an average Q^2 of 9.5 GeV^2/c^2. The total number of collected events is 240. we find that our data agree with QED predictions based either on exact Feynman graph calculations or on the photon structure function expressions.

57856 (DESY—83-018) Experimental study of the hadronic photon structure function. D'Agostini, G.; Apel, W.D.; Banerjee, S.; Bodenkamp, J.; Engler, J.; Fluegge, G.; Fries, D.C.; Fues, W.; Gamerdinger, K.; Hopp, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 15p. (LAL—83-3). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751115.

CELLO Collaboration.

We have measured at PETRA the process eγ -> e + hadrons at an average Q^2 value of 9 GeV^2/c^2. The total number of observed events attributed to this process is 215. Our data are compared to calculations based on the estimation of the photon structure function F_2 in the quark parton model and in QCD.

57857 (DESY—83-019) Tau branching ratios and polarization limits in e^+e^- interactions at $\sqrt{}$ = 34 GeV. D'Agostini, G.; Apel, W.D.; Banerjee, S.; Bodenkamp, J.; Engler, J.; Fluegge, G.; Fries, D.C.; Fues, W.; Gamerdinger, K.; Hopp, G. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 18p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751116.

CELLO Collaboration.

Results on the dominant decays of tau leptons produced in e^+e^--interactions at $\sqrt{s}$ = 34 GeV are presented. From the laboratory momentum spectra of the observed decay products we determine the tau polarization asymmetry to (1+-22)% and thereby derive limits for the vector coupling constant vsub(tau) of the tau to the weak neutral current. Tests on universality and factorization are discussed.

57858 (DESY—83-029) Experimental study inclusive muon spectra at PETRA. Adeva, B.; Barber, D.P.; Becker, U.; Berdugo, J.; Berghoff, G.; Boehm, A.; Branson, J.G.; Burger, J.D.; Capell, M.; Cerrada, M. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 10p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751271.

MARK-J collaboration.

We report the results of a high statistics study of inclusive muon spectra at PETRA. We obtain new mass limits on the production of heavy quarks, heavy leptons, and charged Higgs particles. We show that the fragmentation properties of b quarks and c quarks are different with the mean fragmentation variables <zsub(b)> = 0.75+-0.03+-0.06, <zsub(c)> = 0.46+-0.02+-0.05 and the average semi-leptonic branching ratios for the B and C hadrons (BR(B) = 10.5+-1.5+-1.3%, BR(C) = 11.5+-1.0+-1.7%.

57859 (DOE/ER/40033—50) Study of two-jet events at $\sqrt{s}$ = 62 GeV using a total neutral energy trigger. Angelis, A.L.S.; Basini, G.; Besch, H.J.; Breedon, R.E.; Camilleri, L.; Chapin, T.J.; Cool, R.L.; Cox, P.T.; von Gagern, C.; Grosso-Pilcher, C. (Rockefeller Univ., New York (USA)). Jul 1983. Contract AC02-81ER40033. 15p. (CONF-830718—9). NTIS, PC A02/MF A01. Order Number DE83016326.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

Using a full azimuth electromagnetic calorimeter we have measured the spectrum dN/dE/sub T/^{0}, E/sub T/^{0} = neutral transverse energy, in pp collisions at $\sqrt{s}$ = 62 GeV over the E/sub T/^{0} range from 10 to 35 GeV. Charged particles were measured in a system of drift chambers located in a magnetic field and covering the same acceptance. Two-jet events become an increasingly dominant component of the data as E/sub T/^{0} increases above 20 GeV, as can be seen from the decrease in mean sphericity of the events. We discuss the fragmentation of the jets in terms of j/sub T, the transverse momentum perpendicular to the jet direction. We compare the mean P/sub T/ of the dijet system to that in $\pi^0\pi^0$ and hadronic e^+e^- events at the same $\sqrt{s}$.

57860 (DOE/ER/40033—51) Comparison between p anti p and pp interactions at the ISR for high p/sub T/ and E/sub T/^{0} spectra. CERN - Michigan State University - Oxford - Rockefeller (CMOR) Collaboration. (Rockefeller Univ., New York (USA)). Jul 1983. Contract AC02-81ER40033. 9p. (CONF-830718—10). NTIS, PC A02/MF A01. Order Number DE84001258.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

In December 1982 much more p anti p data at $\sqrt{s}$ = 53 GeV were accumulated at the CERN ISR than during the run in October 1981. Preliminary results are presented both for a single particle trigger and for a total electromagnetic energy trigger. No significant differences between p anti p and pp interactions were observed.

57861 (INIS-mf—8532) Study of the weak charged currents in the inclusive neutrino-nucleon scattering at high energies. Grote, H. (Hamburg Univ. (Germany, F.R.). 2. Inst. fuer Experimentalphysik; Hamburg Univ. (Germany, F.R.). Fachbereich Physik). 19 Jun 1981. 119p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703579.

In the present thesis the total cross sections sigma(νN->μX) and the differential cross sections dsigma/dy(νN->μX) of the deep inelastic neutrino-nucleon scattering in the energy range from 20 to 200 GeV were studied.

57862 (INIS-mf—8533) Study of the neutral current properties in the semileptonic inclusive neutrino and antineutrino nucleon interaction. Kroeger, B. (Hamburg Univ. (Germany, F.R.). 2. Inst. fuer Experimentalphysik; Hamburg Univ. (Germany, F.R.). Fachbereich Physik). 30 Mar 1981. 99p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83703580.

In the dechromatic neutron beam of the CERN-SPS results obtained with the CHARM detector from the deep inelastic inclusive neutrino-nucleon scattering were analyzed according to following reactions: νsub(μ)(anti νsub(μ))+N->$\mu^-(\mu^+)$ + hadrons and νsub(μ)(anti νsub(μ))+N->νsub(μ)(anti νsub(μ)) + hadrons. The aim of these studies was the determination of the coupling of neutral currents in the weak interaction. All data can be well described by the standard model for the unification of the electrogmagnetic and weak interaction in connection with the quarkparton model, if a Weinberg angle of sin^{2}deltasub(w)=0.222+-0.016 is assumed.

57883 (LA-UR—83-2610) Physics at the proposed National Underground Science Facility. Nieto, M.M. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 15p. (CONF-830689—7). NTIS, PC A02/MF A01. Order Number DE84001345.

From 14. international symposium on multiparticle dynamics; Lake Tahoe, NV, USA (22 Jun 1983).

The scientific, technical, and financial reasons for building a National Underground Science Facility are discussed. After reviewing examples of other underground facilities, we focus on the Los Alamos proposal and the national for its choice of site.

57884 (SLAC-PUB—3127) e+e- collisions in the multi-TeV region. Ellis, J. (Stanford Linear Accelerator Center, CA (USA)). May 1983. Contract AC03-76SF00515. 22p. (CONF-830689—5). NTIS, PC A02/MF A01. Order Number DE84000993.

From 14. international symposium on multiparticle dynamics; Lake Tahoe, NV, USA (22 Jun 1983).

A leading role in the elucidation of the Standard Model during the last few years has been played by e+e- colliding beam experiments. The e+e- discoveries have been made possible by the cleanliness of the experimental conditions and the ability to tune the centre-of-mass energy with precision to the desired value, thus avoiding less interesting background events. We expect history to repeat itself in the next step of elucidating physics beyond the Standard Model. Just as past e+e- machines such as SPEAR, DORIS and CESR have uncovered physics inaccessible to hadron-hadron collisions with a centre-of-mass energy several times higher, so we feel that future e+e- colliders will provide information that could not be duplicated by hadron colliders with much larger centre-of-mass energies. There is a general consensus that the next interesting energy range is likely to be in the TeV range. It is in this energy range that whatever physics provides and stabilizes the masses of the intermediate vector bosons must be revealed. Unravelling this mass generation mechanism takes us beyond the gauge principle of the Standard Model which has been so triumphantly vindicated in recent months. Therefore we discuss here the capabilities and attributes of an e+e- collider with at least 1 TeV energy per beam. We believe that by enabling an important new energy domain to be explored in detail, such an e+e- collider provides physics opportunities which cannot be paralled by hadron-hadron colliding rings with centre-of-mass energies several times higher. (WHK)

57885 (SLAC-PUB—3196) B-meson lifetime from the MAC detector. Chadwick, G.B. (Stanford Linear Accelerator Center, CA (USA)). 1983. Contract AC03-76SF00515. 2p. (CONF-830718—11). NTIS, PC A02/MF A01. Order Number DE84001256.

From International Europhysics conference on high energy physics; Brighton, UK (20 Jul 1983).

The MAC detector has been run at PEP at $\sqrt{s}$ = 29 GeV enough to collect 108 pb^{-1} integrated luminosity of e+e- collisions, and a sample of about 50,000 multihadron events was isolated. By the flavor-tagging procedure direct leptons associated with these events were identified: muons by their lack of interaction in the iron of the hadron calorimeter and appearance as clear tracks in a system of drift tubes surrounding the calorimeter. Electrons are identified in a lead-proportional shower chamber immediately surrounding the central drift chamber (of 1 m diameter and with first layer ~ 12 cm from the beam. The b-enriched sample is selected from these as having a lepton over 2 GeV/c with momentum transverse to the event thrust axis over 1.5 GeV/c. This procedure gives 155 muon and 113 electron events, estimated by Monte Carlo technique to be respectively 72% and 63% pure b-quark associated. The impact parameter δ of the lepton track with respect to the average beam position, as determined from Bhabha scattering events from the same exposure, was then plotted. Allowing for contributions from c-quark and background events, the combined data gives T/sub b/ = (1.8 +- 0.6 +- 0.4) x 10^{-12}sec where the last error is the estimated systematic error.

57886 Analyzing power for the p vector+p->d+π^+ reaction at 0.8 GeV and effects of dibaryon admixtures. Seth, K.K.; Saha, A.; Kielczewska, D.; Iversen, S.; Kaletka, M.; Barlow, D. (Northwestern Univ., Evanston, IL (USA)); Hoistad, B. (Los Alamos National Lab., NM (USA)). *Physics Letters, [Section] B;* **126**: No. 3/4, 164-168(30 Jun 1983).

A precision measurement of the angular distribution of the analyzing power of the reaction p vector+p->d+π^+ has been made at 0.8 GeV. It is shown that none of the existing theoretical calculations, including those which introduce resonant dibaryon amplitudes, reproduce even the qualitative features of the data. It is concluded that our data do not require dibaryon admixtures of the kind proposed for the interpretation of recent data on vector analyzing power, iT_{11}(THETA), of π-d elastic scattering at the same center of mass energy.

6452 Particle Interactions And Properties - Theoretical

REFER ALSO TO CITATION(S) 57864

57887 (DESY—83-024) Confining SU(2)sub(L) x SU(2)sub(R) gauge model of the weak interactions. Schrempp, B.; Schrempp, F. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 48p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751128.

With the aim of understanding weak interactions as residual hypercolor interactions among composite quarks and leptons, we investigate a confining SU(2)sub(L) x SU(2)sub(R) hypercolor gauge theory with only fundamental fermions (i.e. without fundamental scalars). A scenario with two different confinement scales, Asub(L) proportional Gsub(F)sup(-1/2) proportional 300 GeV and Asub(R) > Asub(L), is systematically analyzed as function of the parameter zeta = Asub(R)/Asub(L). The general requirement of anomaly saturation is combined with effective Lagrangian techniques - a powerful procedure also of interest for more general confining product groups. Two solutions, separated by a phase boundary, emerge. Phase I for 1 <= zeta<zetasub(crit): a left-right symmetric spectrum of massless composite quarks and leptons with a possibility for dominance of V-A effective low-energy interactions. Phase II for zeta > zetasub(crit): only left-handed massless composite quarks and leptons (of the Abbott-Farhi type). Phase II results from separate anomaly saturation at the two scales Asub(R) and Asub(L), Phase I from joint anomaly saturation (matching). Dynamical insight comes from treating confinement in two steps, at Asub(R) and Asub(L) consecutively, which amounts to a complementary version of the technicolor mechanism; it necessarily entails the appearance of Goldstone bosons in the intermediate momentum range, Asub(L) < p < Asub(R), which play the role of dynamical scalars being subject to SU(2)sub(L) confinement.

57888 (DESY—83-030) Possible open channel effects in the charmonium spectrum. Barbour, I.M.; Gilchrist, J.P. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 23p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751270.

The non-relativistic quark model is used to investigate the effects of open channels and possible (qanti q)^2 dimensonium states on the charmonium spectrum. An alternative interpretation of the structures in R above threshold is proposed.

57889 (LBL—16420) Jet cross sections in electron-positron annihilation. Sharpe, S.R. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 66p. NTIS, PC A04/MF A01. Order Number DE84000472.

Thesis.

There are few, if any, detailed tests of QCD at present. I discuss the problems associated with testing QCD and argue that the three jet angular distribution in electron-positron annihilation is a good quantity to use because it minimizes the sensitivity to nonperturbative effects and provides a test of the detailed structure of QCD. However, for such a test to be possible, the perturbation expansion must be well behaved. I present a calculation of the perturbative corrections using two different generalizations of the Sterman-Weinberg two-jet cross section. I argue that because of the uncertainties in our understanding of hadronization it is necessary that the corrections to both these cross sections be small. In presenting the results I use the recent proof of Mukti and Sterman that all the logarithms can be resummed. I find that at Z-factory energies there is a substantial region of parameters defining the jets for which the correction is small, but that there is no such region at PEP/PETRA energies. This problem at PEP/PETRA energies is made worse by the results of a study of the effects of hadronization. Using a simple model I find very significant effects at PEP/PETRA energies that would make a test difficult. These effects do not, however, present problems at Z-factory energies. I conclude that, even if there are further theoretical advances, testing QCD at PEP/PETRA energies using the three-jet angular distribution will be very difficult. However, this distribution can be used to test QCD in a detailed way at Z-factory energies. The corrected results, furthermore, show a systematic difference from the lowest order result that may be measurable at Z-factory energies. If this effect could be measured it would provide a yet more detailed test of QCD, testing, for example, the three gluon coupling. 66 references.

57870 **(LBL—16541) Spectroscopy of gluonic states at LAMPF II.** Chanowitz, M.S. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 15p. (CONF-830798—3). NTIS, PC A02/MF A01. Order Number DE84001037.

From 3. LAMPF II workshop; Los Alamos, NM, USA (18 Jul 1983).

The properties of QCD which imply the existence of gluonic states are reviewed. The problem of discovering the spectrum of gluonic states is discussed in general and illustrated with examples from current data. Higher statistics fixed target experiments, such as could be performed at LAMPF II, are essential for further progress.

57871 **(SLAC-PUB—3166) Monte Carlo sensitivity in jet studies - what is the physics.** Hoyer, P. (Stanford Linear Accelerator Center, CA (USA)). Jul 1983. Contract AC03-76SF00515. 14p. (CONF-830689—6). NTIS, PC A02/MF A01. Order Number DE84000994.

From 14. international symposium on multiparticle dynamics; Lake Tahoe, NV, USA (22 Jun 1983).

Tests of perturbative QCD in hard processes involving jets have been found to depend on the jet fragmentation model used. We emphasize the need for testing the factorization of hard and soft processes, i.e., the independent fragmentation of jets. A method of analysis is suggested, which allows a model-independent determination of the gluon fragmentation function from e^+e^- data. We also comment on some simple features expected in anti pp $\rightarrow$ (2 or 3 jets) + X events. 19 references.

57872 **Spectrum of gluino bound states.** Chanowitz, M. (Lawrence Berkely Lab., CA (USA)); Sharpe, S. (Lawrence Berkely Lab., CA (USA); California Univ., Berkeley (USA). Dept. of Physics). *Physics Letters, [Section] B;* **126**: No. 3/4, 225-230(30 Jun 1983).

Using the bag model to first order in α_s we find that if light gluinos exist they will appear as constituents of electrically charged bound states which are stable against strong interaction decay. We review the present experimental constraints and conclude that light, long-lived charged hadrons containing gluinos might exist with lifetimes between 2×10^{-8} and 10^{-14}s.

57873 **Charged particle scattering in a magnetic and a laser field and nonlinear bremsstrahlung.** Bergou, J.; Varro, S. (Hungarian Academy of Sciences, Budapest. Central Research Inst. for Physics;; Ehlotzky, F. (Innsbruck Univ. (Austria). Inst. fuer Theoretische Physik). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The transition amplitude of charged-particle scattering by a background potential V(r) in the simultaneous presence of a magnetic and a laser field is determined in closed form. Conservation laws, selection rules and field dependences are discussed in detail. The connection with previous more restricted treatments as well as possible applications are also established.

6453 Particle Invariance Principles And Symmetries

57874 **(LA-UR—83-2648) Neutron-oscillation experiments using ultracold neutrons.** Petschek, A.G. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 14p. (CONF-8309163—1). NTIS, PC A02/MF A01. Order Number DE84001339.

From Conference on low energy tests of conservation laws in particle physics; Blacksburg, VA, USA (12 Sep 1983).

The figure of merit for a neutron oscillation experiment using ultracold neutrons is shown to be competitive with that for beam experiments.

6454 Field Theory

REFER ALSO TO CITATION(S) 57864

57875 **(DESY—83-013) Bare and induced masses of Susskind fermions.** Mitra, P.; Weisz, P. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 4p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751085.

It is shown that the mass matrix for Susskind fermions on the lattice cannot have more than two distinct eigenvalues if cubic symmetry is enforced. If the standard interaction is replaced by one proposed by Becher and Joos, degeneracy-lifting mass counterterms are induced. The Λ-parameter is calculated.

57876 **(DESY—83-015) Improved continuum limit in the lattice O(3) non-linear sigma model.** Berg, B.; Montvay, I.; Meyer, S.; Symanzik, K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751113.

First Monte Carlo results are reported for the two-dimensional O(3) non-linear sigma model with an action perturbatively improved up to one-loop order. We find a markedly improved scaling behaviour of the correlation length and of the magnetic susceptibility. The universal parts of the β- and γ-functions are approached fast by the numerically calculated functions.

57877 **(DESY—83-016) Continuum limit and improved action in lattice theories. Pt. 1.** Symanzik, K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 31p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751112.

Corrections to continuum theory results stemming from finite lattice-spacing can be diminished systematically by use of lattice actions that include also suitable irrelevant terms. We describe in detail the principles of such constructions at the example of PHI^4 theory.

57878 (DESY—83-021) Interaction of a fermion with a monopole. Pt. 1. Tai Tsun Wu. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Mar 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751118.

It is proposed that some low-energy properties of the interaction of one or more fermions with a monopole are sensitive to, and hence can be used as probes for, extremely small distances. One possible example of such properties is studied in detail.

57879 (DESY—83-026) Continuum limit and improved action in lattice theories II O(N) nonlinear sigma model in perturbation theory. Symanzik, K. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 40p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751269.

The method of paper I of this series is applied to the O(N) nonlinear sigma model. Due to use of non-manifestly-invariant perturbation theory the improvement part of the action, computed explicitly to one-loop order, is not manifestly O(N) invariant. It can be brought into manifestly O(N) invariant form by use of linear identities among dimension-four operators, which follow from the field equations of the unimproved action. The adequacy of the resulting two-parameter family of manifestly O(N) invariant improved actions is verified to one-loop order.

57880 (DESY—83-027) Exotic infrared representations of interacting systems. Buchholz, D.; Doplicher, S. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 15p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751267.

It is shown that the algebra of observables in a local quantum field theory has representations of type II and III with positive energy, if the theory includes massless particles which form an asymptotically complete set of scattering states below some mass threshold. So the exotic infrared representations, which have recently been exhibited in free field theory do also appear in interacting models.

57881 (DESY—83-031) Lambda scale for the improved lattice O(N) non-linear sigma model. Berg, B. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)). Apr 1983. 11p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751268.

Using the background field technique I compute Asub(L)sup(I)/Asub(L)sup(S) in agreement with a calculation by Symanzik. Implications for Monte Carlo simulations are also discussed.

57882 (DOE/ER/03992—512) Some double-valued representations of the linear groups. Ne'eman, Y. (Texas Univ., Austin (USA); Tel Aviv Univ. (Israel)). Jan 1983. Contract AS05-76ER03992. 27p. NTIS MF A01. Order Number DE84001525.

Microfiche only, copy does not permit paper copy reproduction.

We review the mathematical theory of SL(n,R) and its double-covering group anti SL(n,R), especially for n = 2, 3, 4. After discussing a variety of physical applications, we show that anti SL(3,R) provides holonomic curved space (world) spinors with an infinite number of components. We construct the relevant holonomic manifield and discuss the gravitational interaction of a proton as an example. 41 references.

57883 Composite model with confining SU(N)XSU(2)sub(L)XSU(2)sub(R) hypercolor. Albright, C.H. (Fermi National Accelerator Lab., Batavia, IL (USA); Northern Illinois Univ., De Kalb (USA). Dept. of Physics). *Physics Letters,* [*Section*] *B;* **126**: No. 3/4, 231-235(30 Jun 1983).

A model of composite quarks and leptons is constructed with confining SU(N)xSU(2)sub(L)xSU(2)sub(R) hypercolor interactions such that only standard quark and lepton families appear in global SU(2)sub(L)xSU(2)sub(R) doublets. Several generations are admitted by the anomaly-matching conditions and labeled by a discrete axial symmetry. The SU(N) interactions are N independent and play the role of technicolor. Three conserved U(1)sub(V) charges identified with Q, B-L and B+L prohibit qqq->lsup(c) transitions.

65 PHYSICS RESEARCH

6510 Nuclear Physics

57884 (DOE/ER/04215—T1) Nuclear structure studies at intermediate energies. Technical progress report, September 1982-September 1983. Hintz, N.M. (Minnesota Univ., St. Paul (USA)). 1983. Contract AC02-77ER04215. 11p. NTIS, PC A02/MF A01. Order Number DE84001268.

Nuclear structure studies by the Minnesota group via proton reactions at LAMPF are summarized. Also, measurements of inelastic cross sections and T_{20} for the vector p vector p → vector d vector π^+ reaction are discussed. Theoretical studies are outlined including excitation of the isovector giant monopole in the (π^-, π^0), (p, n), and (n, p) reactions, survey of intermediate energy proton inelastic scattering, and K^+-nucleus scattering and (K^+, K^0) charge exchange reactions. Publications are listed. (WHK)

57885 (HMI—393) Progress report 1982. Gross, D.H.E.; Fuchs, H.; Grawe, H.; Stolterfoht, N.; Ziegler, K. (Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (Germany, F.R.). Bereich Kern- und Strahlenphysik). 1982. 128p. (In German). Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.).

This annual report contains extended abstracts of the results of research and development in the named institute together with a list of publications and speeches. The research concerns theoretical physics, nuclear reactions, hyperfine interactions, atomic collisions and the VICKSI accelerator.

57886 (UCID—19904) Nuclear data for applications manpower survey - 1982: Nuclear Data Committee. Haight, R.C. (Lawrence Livermore National Lab., CA (USA)). Oct 1983. Contract W-7405-ENG-48. 43p. NTIS, PC A03/MF A01. Order Number DE84001082.

To assess the manpower in nuclear data for applications, the Nuclear Data Committee conducted a survey in 1982 of personnel at institutions that have a major commitment to providing such data. Responses were received from 333 researchers (including 55 students) who are estimated to constitute 90% of the manpower base at the 33 organizations responding to the survey. Those researchers who spend 10% or more of their time in nuclear data for applications are defined to be active in the field; 175 respondents fall in this category. The non-student researchers active in the field average 47 years of age and spend about 83 man-years per year on nuclear data activities. Data were also compiled on the educational background of the respondents, source of research support, citizenship, profession, types of nuclear data and other activities, use of experimental facilities, and specialties. Career goals of the students are summarized. Some inferences on the present and future manpower in nuclear data are drawn from these results.

57887 (UCID—19907) Status report for data files and Monte Carlo transport codes maintained by the Physical Data Group of LLNL. Howerton, R.J. (Lawrence Livermore National Lab., CA (USA)). 18 Oct 1983. Contract W-7405-ENG-48. 5p. NTIS, PC A02/MF A01. Order Number DE84001666.

The Physical Data Group of the Theoretical Physics Division of LLNL has developed and maintains several basic data files, several Monte Carlo transport codes, and the requisite processing codes that convert the basic data to the form required by our own transport codes and by other laboratory transport and burn codes. The data files (libraries) that we maintain are listed together with a few comments about each.

57888 Research at the Argonne linac. Henning, W. (Argonne National Lab., IL (USA)). *Nuclear Physics* [*Section*] *A;* **400**: 295c-313c(23 May 1983). (CONF-820979—).

From International conference on nucleus-nucleus collisions; East Lansing, MI, USA (27 Sep 1982).
With 33 refs.
This is a brief report on some of the research activities which, in short, are concerned with the various aspects of the relationships between heavy-ion-induced reactions and nuclear structure. Major interests are the structure of nuclei at high excitation, far from stability or in states of high spin near the yrast line.

6511 Experimental Techniques

REFER ALSO TO CITATION(S) 57549

6512 Nuclear Properties And Reactions, A=1-5

57889 (INIS-mf—8540) Determination of the proton spectral function of ^{3}He with the (e,e'p) reaction. Jans, E. (Amsterdam Univ. (Netherlands)). 1 Sep 1982. 135p. NTIS (US Sales Only), PC A07/MF A01. Order Number DE83703581.
Includes Dutch summary; 85 refs.
Cross sections of the ^{3}He(e,e'p) reaction have been measured with the 600 MeV linear accelerator at Saclay and the two-spectrometer set-up of the experimental hall HE1. The data cover the following region for the missing energy Esub(m) and the proton recoil momentum k: 0 < Esub(m) < 80 MeV and 0 < k < 310 MeV/c. Three-body ground-state wave functions, which have been obtained from Faddeev and variational calculations, performed with realistic NN-potentials, are discussed in chapter II. In chapter III the coincidence cross section is discussed in the plane wave impulse approximation (PWIA). The spectral function and its sum rules are introduced. The linear accelerator, the experimental hall and the liquid ^{3}He target are described in chapter IV. The experimental procedure, the data analysis, and the corrections which have been applied to the data, are discussed in chapter V. The results of the experiment are presented in chapter VI. The (e,e'p) reaction has proven its capabilities in obtaining detailed information on nuclear structure properties as nucleon momentum density distributions and separation energies, although corrections due to FSI and MEC have to be considered. In the case of ^{3}He, the results can be compared to predictions of various calculational techniques, using realistic NN-potentials and thus serve as a test for NN-potential models.

6513 Nuclear Properties And Reactions, A=6-19

57890 (FRNC-TH—1145) Muon capture by the 1p shell of ^{10}B, ^{12}C and ^{14}N nuclei. Experiments and interpretation. de Moura Goncalves, A.C. (Paris-11 Univ., 91 - Orsay (France)). Dec 1980. 183p. (In French). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83781091.
The main elements necessary to treat weak interactions in a nucleus including the contributions of exchange meson currents are presented. The case of a transition between an initial (Z,A) nucleus and a final (Z-1,A) nucleus in a well defined bound state is treated. The form of the single body operator taking into account the nucleonic degrees of freedom (impulse approximation) is recalled. The construction of a two-body operator taking mesonic degrees of freedom into account is outlined. Measurements of partial capture rates in ^{10}B, ^{12}C and ^{14}N target nuclei leading to excited bound states of ^{10}Be, ^{12}B and ^{14}C residual nuclei are described. Results are given and comparisons made with the calculations performed, nuclear states being described by various wave functions. Measurements of the polarization of the 1^+ ground state of ^{12}B after N capture in ^{12}C are briefly described. An attempt is made to interpret the $0^+ <-> 1^+$ transition occurring in the A = 12 triad. A convenient parametrization is obtained from the expression for these observable quantities as a function of the nuclear shape factors. This analysis enables a strict choice to be made from the available wavefunctions. It demonstrates that experimental data are well reproduced by the microscopy approach performed using the effective Sussex potential and single pion exchange currents. Finally, the hitherto unexplored domain of muon capture is tackled. A high energy transfer is involved in which the neutrino remains practically at rest. In this case, the vector part is not very important and the axial current time part contributes as much is the space part. The (μ^-,pn) reaction was used for exploratory measurements in this domain. Practical limits are determined.

57891 (GSI—82-17) Nucleon transfer at the example of the ^{13}C(^{13}C,^{12}C)^{14}C reactions. Koennecke, R. (Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (Germany, F.R.)). Dec 1982. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751083.
On the basis of molecular wave functions a theory of nucleon-transfer in heavy ion reactions is presented. The particle-core-model for a system of two cores and N- valence nucleons is applied by using two-center shell model (TCSM) wavefunctions for the extra particles and describing to collectively excitable cores by rotator- vibrator models. Potentials for shape polarization are contained in the two-center shell model and in the interaction between the cores. The transfer (and excitation) of the valence particles is caused by the radial and rotational couplings. Using the same TCSM in all fragmentations, numerical calculations are made for the real neutron transfer reaction ^{13}C (^{13}C, ^{12}C) ^{14}C. The excitation function shows prominent structures as seen in experiment but not produced in a single-step (DWBA-) treatment. Therefore, the nucleon transfer in this system relies on a molecular orbital mechanism.

57892 (INIS-mf—8549) Production and study of polarized recoil nuclei from sup(->)Li-induced heavy ion reactions. Koenig, I. (Marburg Univ. (Germany, F.R.). Fachbereich Physik). 16 Jun 1981. 110p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83703582.
By measurement of the β asymmetry in different reactions, which were induced by vector polarized sup(6->)Li and sup(7->)Li, a polarization transfer could be detected. In one-particle and multinucleon transfer reactions polarized ^{8}Li, ^{12}B, and ^{20}F nuclei were produced, whereby for the ground state polarization values up to 0.3 were measured. It was tried to produce in different compound-nucleus reactions polarized residual nuclei, the nuclear moments of which are not known, and which cannot be formed in reactions with light projectiles. In none of the hitherto studied cases a ground state polarization different from zero in the framework of the statistical error could by detected. Possible reasons for this are discussed. The spin-lattice relaxation times of ^{8}Li in different metals with cubic face-centered lattice structure were measured at room temperature. The longest relaxation time was with (16,8+-3.1) s observed in gold.

6514 Nuclear Properties And Reactions, A=20-38

REFER ALSO TO CITATION(S) 57905, 57966

57893 (INIS-mf—8191) Measurement of the depolarization of the reaction ^{27}Al(p vector,p vector.)^{27}Al for the study of the spin-spin potential. Loeh, H. (Erlangen-Nuernberg Univ., Erlangen (Germany, F.R.). Naturwissenschaftliche Fakultaet 1 - Mathematik und Physik). 31 Jul 1981. 62p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83781092.
For the study of the spin-spin interaction in the optical potential the depolarisation in the elastic scattering of polarized protons was measured. The double-scattering experiments were performed in the angular range 40^0-110^0 at an incident energy of 10.35 MeV at the Erlangen QD-magnetic spectrometer. The determination of the optical model parameters independent from the spin-spin potentials was performed by the fitting of these to the observables <sigmaA> and sigmasup(di). These were obtained from a measurement of the angular distribution of the analyzing power and the differential cross section in the 4π-scattering chamber for the reaction ^{27}Al(p vector,p_0) at the same energy. The compound contributions present at this energy, which can also influence the depolarization, were regarded by the calculation of the compound-elastic non-spin-flip respectively spin-flip subcross sections by means of the formalism of Hofmann, Richert, Tepel and Weidenmueller. Because the target nucleus ^{27}Al possesses in the ground state a spin I=5/2, also the possible quadrupole spin flip had to be included. This was performed by coupled-channel calculations. The respecting com-

pound contributions and quadrupole effects corrected depolarization data could by used for the study of the spin-spin potentials by means of DWBA calculations. As result it was shown that for the description of the experimental data a spherical spin-spin potential of the strength Vsub(SS)=1.5+-0.3 MeV had to be assumed.

57894 **Beta-delayed proton decay of the Tsub(Z)=-2 isotope ^{26}P.** Cable, M.D.; Honkanen, J.; Parry, R.F.; Zhou, S.H.; Zhou, Z.Y.; Cerny, J. (California Univ., Berkeley (USA). Dept. of Chemistry; California Univ., Berkeley (USA). Lawrence Berkeley Lab.). *Physics Letters,* [*Section*] *B;* **123**: No. 1/2, 25-28(24 Mar 1983).

The ^{28}Si(^{3}He,p4n) ^{26}P reaction at 110-130 MeV has been used to discover the odd-odd Tsub(z)=-2 nuclide ^{26}P (tsub(1/2)approx.=20 ms), which was predicted to lie on or beyond the proton drip line. Beta-delayed protons from its decay establish the mass excess of the lowest T=2 state in ^{26}Si as 5.936 +- 0.015 MeV. Possible beta-delayed two-proton emission from this isotope is discussed.

6515 Nuclear Properties And Reactions, A=39-58

REFER ALSO TO CITATION(S) 57905

57895 **(LA-UR—83-2587) Excitation of giant resonances in pion charge-exchange reactions.** Auerbach, N. (Los Alamos National Lab., NM (USA); Tel Aviv Univ. (Israel). Dept. of Physics and Astronomy). 1983. Contract W-7405-ENG-36. 16p. (CONF-830970—1). NTIS, PC A02/MF A01. Order Number DE84001356.

From International symposium on highly excited states and nuclear structure; Orsay, France (5 Sep 1983).

The theory for excitation of electric giant isovector resonances in pion charge-exchange reactions is discussed. A comparison between the theoretical and the recent experimental results is made. 18 references.

6516 Nuclear Properties And Reactions, A=59-89

REFER ALSO TO CITATION(S) 57895

57896 **(INIS-mf—8201) Gamma spectroscopic studies of the neutron-deficient g-g nucleus ^{74}Kr by means of a neutron multiplicity measurement technique.** Roth, J. (Koeln Univ. (Germany, F.R.). Mathematisch-Naturwissenschaftliche Fakultaet). 19 Dec 1981. 93p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83781093.

The g-g nucleus ^{74}Kr was studied by means of the reaction ^{58}Ni (^{19}F, p2nγ) ^{74}Kr. In order to make gamma spectroscopic studies at neutron deficient nuclei like ^{74}Kr a neutron multiplicity measurement technique was developed. Beside γ single spectra, γ excitation functions, γ-γ coincidences, γ angular distributions, and lifetime measurements by means of this technique all measurements in coincidence with up to two neutrons were taken up. From these measurement data, an extended term scheme with 17 newly found excited states could be extracted. To all levels spins and parities could be assigned. From the four energetically lowest levels of the yrast cascade, the mean lifetimes could be determined. A double backbending in the sequence of the yrast cascade was interpreted as crossing of the g 9/2 bands. The irregularities in the lower part of the yrast band correspond to the shape consistence picture. The results were considered in connection with the systematics of the even krypton isotopes and compared with a two-quasiparticle-plasrotor model calculation.

6517 Nuclear Properties And Reactions, A=90-149

REFER ALSO TO CITATION(S) 57895, 57897

6518 Nuclear Properties And Reactions, A=150-189

57897 **(CONF-821143—10) γ-ray decay and nuclear shapes in ^{158}Yb.** Jaeaeskelaeinen, M.; Sarantites, D.G.; Dilmanian, F.A.; Woodward, R.; Puchta, H.; Beene, J.R.; Hattula, J.; Halbert, M.L.; Hensley, D.C. (Washington Univ., St. Louis, MO (USA). Dept. of Chemistry; Oak Ridge National Lab., TN (USA)). 1982. Contract W-7405-ENG-26. 13p. NTIS, PC A02/MF A01. Order Number DE84001393.

From High angular momentum properties of nuclei conference; Oak Ridge, TN, USA (2 Nov 1982).

The decay of the entry states in ^{158}Yb populated in the reactions of 149 MeV ^{20}Ne with ^{144}Nd and ^{146}Nd has been investigated with a 4 π multidetector system gated by a Ge counter. The average exitation energy, the γ-ray spectra and the angular distributions as a function of multiplicity show several changes in the γ-ray decay. These changes suggest a transition from prolate to particle aligned oblate configuration at I $\sim$ 28. At I 38 to 48 collective transitions with dipole and quadrupole component are observed. Possible explanations for these transitions are discussed in terms of nuclear shapes. Furthermore, above I $\sim$ 48 the dipole component disappears suggesting a further change toward more triaxial shape. 19 references.

57898 **(DOE/ER/04052—61) Evidence for a transition from prolate to oblate to triaxial shapes in ^{158}Yb.** Jaeaeskelaeinen, M.; Sarantites, D.G.; Dilmanian, F.A.; Woodward, R.; Puchta, H.; Beene, J.R.; Hattula, J.; Halbert, M.L.; Hensley, D.C. (Oak Ridge National Lab., TN (USA); Washington Univ., St. Louis, MO (USA). Dept. of Chemistry). 1982. Contract W-7405-ENG-26. 13p. (COO—4052-61). NTIS, PC A02/MF A01. Order Number DE84001398.

The decay of the entry states in ^{158}Yb populated in the reactions of 149 MeV ^{20}Ne with ^{144}Nd and ^{146}Nd has been investigated with a 4π multidetector system gated by a Ge counter. The average exitation energy, the γ-ray spectra and the angular distributions as a function of multiplicity show several changes in the γ-ray decay. These changes suggest a transition from prolate to particle aligned oblate configuration at low spin. At I $\sim$ 38 to 48 collective transitions with dipole and quadrupole component possibly built on high K single particle states are observed. Furthermore, above I $\sim$ 48 the dipole component disappears suggesting a further change toward more triaxial shape. 16 references.

57899 **Suppression of multiple rotational excitation in heavy ion inelastic scattering above the Coulomb barrier.** Baltz, A.J.; Bond, P.D. (Brookhaven National Lab., Upton, NY (USA)). *Physics Letters,* [*Section*] *B;* **125**: No. 1, 25-29(19 May 1983).

Quantum mechanical calculations of ^{134}Xe + ^{152}Sm inelastic scattering indicate that heavy ion induced excitation of high spin rotational states should be strongly suppressed at bombarding energies above the Coulomb barrier. The several mechanisms contributing to this effect are discussed.

6519 Nuclear Properties And Reactions, A=190-219

REFER ALSO TO CITATION(S) 57895

6520 Nuclear Properties And Reactions, A=220 And Above

57900 **(INIS-BR—27) Determination of the fission products yields, lanthanide and yttrium, in the fission of ^{238}U with neutrons of fission spectra.** Nicoli, I.G. (Rio de Janeiro Univ. (Brazil). Coordenacao dos Programas de Pos-graduacao de Engenharia). Jun 1981. 84p. (In Portuguese). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83781101.

A radiochemical investigation is performed to measure the cumulative fission product yields of several lanthanides and yttrium nuclides in the ^{238}U by fission neutron spectra. Natural and depleted uranium are irradiated under the same experimental conditions in order to find a way to subtract the contribution of the ^{238}U fission. ^{235}U percentage in the natural uranium was 3.5 times higher than in the depleted uranium. Uranium oxides samples are irradiated inside the core of the Argonaut Reactor, at the Instituto de Engenharia Nuclear, and the lanthanides and yttrium are chemically separated. The fission products gamma activities were detected, counted and analysed in a system constituted by a high resolution Ge(Li) detector, 4096 multichannel analyser and a PDP-11 computer. Cumulative yields for fission products with half-lives between 1 to 33 hours are measured: ^{95}Y, ^{141}La, ^{143}La, ^{143}Ce and ^{149}Nd. The chain total yields are calculated. The cumulative fission yields measured for ^{95}Y, ^{141}La, ^{143}La, ^{143}Ce and ^{149}Nd are 4,49%, 4,54%, 4,95%, 4,16% and 1,37% respectively and they are in good agreement with the values found in the literature.

57901 **(INIS-mf—8556) Systematic studies on the determination of cross sections for spallation products from the reaction of 600 MeV protons with ^{232}Thorium.** Westmeier, W. (Marburg Univ. (Germany, F.R.). Fachbereich Physikalische Chemie). 24 Jun 1981. 187p. (In German). NTIS (US Sales Only), PC A09/MF A01. Order Number DE83703583.

The present thesis is a contribution to the systematic study of proton induced spallation and CKO reactions on an easily fissionable target nucleus in the example of the nuclear reactions of 600 MeV protons with ^{232}Thorium. Together with the data of other experiments the mass yield distribution for products were constructed which were formed by CKO and spallation reactions. From the analysis of isotope yield distributions the systematics of the cross sections as function of the number of evaporated protons respectively neutrons were calculated. By means of a new developed Monte Carlo computer code for the description of the particle emission in the framework of the statistical model the experimental mass yield distribution and at the same time the isotope yield distributions could be well reproduced. Thereby it was clearly shown that the particle emission before reaching a statistical energy equilibrium in the target nucleus is an important part in the description of the reaction process. For the description of the cross section of CKO reactions a simple dependence in the framework of the optical model can be proposed.

57902 **(KFK—3503) Neutron capture and fission cross section of americium-243 in the energy range from 5 to 250 keV.** Wisshak, K.; Kaeppeler, F. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Inst. fuer Angewandte Kernphysik). Apr 1983. 56p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751119.

The neutron capture and subthreshold fission cross section of ^{243}Am was measured in the energy range from 5 to 250 keV using ^{197}Au and ^{235}U as the respective standards. Neutrons were produced via the ^{7}Li(p,n) and the T(p,n) reaction with the Karlsruhe 3-MV pulsed Van de Graaff accelerator. Capture events were detected by two MoxonRae detectors with graphite and bismuthgraphite converters, respectively. Fission events were registered by a NE-213 liquid scintillator with pulse-shape discriminator equipment. Flight paths as short as 50-70 mm were used to obtain optimum signal-to-background ratio. After correction for the different efficiency of the individual converter materials the capture cross section could be determined with a total uncertainty of 3-6%. The respective values for the fission cross section are 8-12%. The results are compared to predictions of recent evaluations, which in some cases are severely discrepant.

6530 Nuclear Theory

REFER ALSO TO CITATION(S) 57891, 57893

57903 **(INIS-mf—8195) Global analysis of the elastic ^{3}He scattering in the framework of the optical model.** Trost, H.J. (Hamburg Univ. (Germany, F.R.). Fachbereich Physik). 14 Sep 1981. 122p. (In German). NTIS (US Sales Only), PC A06/MF A01. Order Number DE83781089.

The elastic scattering of ^{3}He at projectile energies from 10 MeV to 220 MeV on target nuclei in the mass range 10 to 208 is coherently studied in the framework of the simple optical model. It succeeds to obtain in the whole range a reasonable description by means of the usual Woods-Saxon potentials. This is illustrated by the presentation of a global mass and energy dependent potential. The light target nuclei are included in these systematics without the introduction of any special procedures. The omission of the antisymmetrization by the use of a purely local potential and the spin-orbit interaction have no important influence in the determination of the central potential. The cancelling of the discerte ambiguity is globally guaranted by the presented parametrization. The tradional sum rule 'number of projectile nucleons multiplied by nucleon-nucleus potential is equal to nucleus-nuclear potential' is not fulfilled. Starting from existing theoretical papers the properties of the global ^{3}He potential can be quantitatively explained. On the base of the ^{3}He potentials determined here and existing nucleon and deuteron potentials finally an approach to a projectile systematic is indicated.

57904 (INIS-mf—8473, pp vp) **Statistical distribution approach to calculation of nuclear data.** Pai, H.L.; Andrews, D.G. (Toronto Univ., Ontario (Canada). Dept. of Chemical Engineering and Applied Chemistry). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

There is a continuing need for reliable neutron cross sections up to the GeV level. Empirical cross sections are still needed below 20 MeV and are very rare above 20 MeV. The present study makes use of the statistical distribution of the daughter nuclei, either Boltzmann or Gaussian, in order to calculate cross sections. For the Boltzmann distribution, examples are cited for: (a) spontaneous fission of actinides (i.e., 0 MeV); (b) 14 MeV (n,2n), (n,p) and (n,chemical bond) cross sections; (c) 14 - 100 MeV (n,xn) cross sections. The Gaussian distribution is illustrated by examples for: (a) yield of fission fragments before neutron emmission; (b) estimation of spallation yields. If one benchmark cross section of a series has been accurately determined, then the rest will follow. Important contributions to compilation of the Evaluated Nuclear Data File (ENDF) are anticipated.

57905 **(LA-UR—83-2851) Recent developments in the understanding of pion-nucleus scattering.** Johnson, M.B. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 55p. (CONF-8307102—1). NTIS, PC A04/MF A01. Order Number DE84001017.

From International symposium on nucleon-nucleon interaction and nuclear many-body problems; Beijing, China (1 Jul 1983).

A development of the theory of pion-nucleus scattering is given in a field theoretical framework. The theory is designed to describe pion elastic scattering and single- and double-charge exchange to isobaric analog states. An analysis of recent data at low and resonance energies is made. Strong modifications to the simple picture of the scattering as a succession of free pion-nucleon interactions are required in order to understand the data. The extent to which the experiment is understood in terms of microscopic theory is indicated. 71 references.

57906 **(LBL—16390) Statistical properties of deep inelastic reactions.** Moretto, L.G. (Lawrence Berkeley Lab., CA (USA)). Aug 1983. Contract AC03-76SF00098. 29p. (CONF-830833—2). NTIS, PC A03/MF A01. Order Number DE84000722.

From International conference on nuclear physics; Florence, Italy (29 Aug 1983).

The multifaceted aspects of deep-inelastic heavy-ion collisions are discussed in terms of the statistical equilibrium limit. It is shown that a conditional statistical equilibrium, where a number of degrees of freedom are thermalized while others are still relaxing, prevails in most of these reactions. The individual degrees of freedom that have been explored experimentally are considered in their statistical equilibrium limit, and the extent to which they appear to be thermalized is discussed. The interaction between degrees of freedom on their way towards equilibrium is shown to create complex feedback phenomena that may lead to self-regulation. A possible example of self-regulation is shown for the process of energy partition between fragments promoted by particle exchange. 35 references.

57907 **Three-nucleon forces and meson-exchange currents in the trinucleon.** Friar, J.L.; Gibson, B.F. (Los Alamos National Lab., NM (USA)); Payne, G.L. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). *Comments on Nuclear and Particle Physics;* 11: No. 2, 51-61(Feb 1983).

The evidence for three-nucleon forces and meson exchange currents in the trinucleon systems is reviewed. The current status of theoretical calculations is described.

6540 Radiation And Shielding Physics

REFER ALSO TO CITATION(S) 57426, 57874, 57887, 57976

57908 **(Juel-Spez—196) KFA-Version of the high-energy transport code HETC and the generalized evaluation code SIMPEL.** Cloth, P.; Filges, D.; Sterzenbach, G.; Armstrong, T.W.; Colborn, B.L. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung). Mar 1983. 105p. NTIS (US Sales Only), PC A06/MF A01. Order Number DE83751281.

This document describes the updates that have been made to the high-energy transport code HETC for use in the German spallation-neutron source project SNQ. Performance and purpose of the subsidiary code SIMPEL that has been written for general analysis of the HETC output are also described. In addition means of coupling to low energy transport programs, such as the Monte-Carlo code MORSE is provided. As complete input descriptions for HETC and SIMPEL are given together with a sample problem, this document can serve as a user's manual for these two codes. The document is also an answer to the demand that has been issued by a greater community of HETC users on the ICANS-IV meeting, Oct 20-24 1980, Tsukuba-gun, Japan for a complete description of at least one single version of HETC among the many different versions that exist.

57909 **Two-frequency investigation of multiple-photon absorption and dissociation of freons in supersonic molecular beam.** Borsella, E.; Fantoni, R.; Giardini-Guidoni, A. (Comitato Nazionale per l'Energia Nucleare, Frascati (Italy)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

Multiple-photon absorption (MPA) and multiple-photon dissociation (MPD) of C_2F_5Cl and CF_3Br have been investigated both in a reaction cell and in a supersonic molecular beam irradiating the molecules by one or two I.R. pulsed CO_2 lasers. Several interesting features have been found as: an increase in the efficiency of dissociation and isotopic selectivity in two-frequency experiments on C_2F_5Cl in cell; the appearance of spectral peaks in the quasi-continuum of C_2F_5Cl cooled in a supersonic beam; the presence of structures in the MPA and MPD spectra of CF_3Br.

6550 Medical Physics

REFER ALSO TO CITATION(S) 57708

57910 **(CONF-8309153—1) Sensitivity and uncertainty investigations for Hiroshima dose estimates and the applicability of the Little Boy mockup measurements.** Bartine, D.E.; Cacuci, D.G. (Oak Ridge National Lab., TN (USA)). 13 Sep 1983. Contract W-7405-ENG-26. 21p. NTIS, PC A02/MF A01. Order Number DE84000715.

From Seminar on measurements and calculations on the replica of Little Boy; Los Alamos, NM, USA (13 Sep 1983).

This paper describes sources of uncertainty in the data used for calculating dose estimates for the Hiroshima explosion and details a methodology for systematically obtaining best estimates and reduced uncertainties for the radiation doses received. (ACR)

57911 **NRC activities in the regulation of radiation.** Minogue, R.B. (Nuclear Regulatory Commission, Washington, DC). pp A31-A49 of Radiation issues for the nuclear industry. Harward, E.D. (ed.). Bethesda, MD; Atomic Industrial Forum, Inc. (1983). (CONF-821077—).

From Atomic Industrial Forum conference on radiation issues for the nuclear industry; New Orleans, LA, USA (3 Oct 1982).

The author discusses (1) the source term for radioactive material that might be released under accident conditions; (2) current efforts to revise 10 CFR Part 20 of the basic radiation-protection standards; and (3) the definition of a level of health risk so low no resources could be justified to control it or be concerned with it (de minimis or regulatory cut-off level).

6560 Solid State Physics

REFER ALSO TO CITATION(S) 57356

57912 **Hole energy and momentum distributions in valence bands.** van der Laan, G. Groningen, Netherlands; Rijksuniversiteit Groningen (1982). 164p. Available from University Library, Oude Kijk in 't Jatstraat 5, 9712 EA Groningen (NL).

In order to understand the electrical and magnetic properties of solids, the knowledge of the density of states and the dispersion relation of the valence bands is indispensable. This thesis offers some alternative methods to obtain information about the nature of the valence band. Part A deals with the energy distribution of the photoelectrons. A simple model, which explains the core hole satellite structure in compounds with large correlation effects between the valence band holes and the created photo-hole, is outlined. CuCl, CuX_2 (X = F, Cl and Br) are studied, by photoemission and Auger electron spectroscopies in determining the valence band properties. Part B deals with the simultaneous measurement of the energy and the wave vector of the emitted electrons. A practical example is given for the determination of the dispersion relation in copper. The measurements of a surface resonance band and the distribution of the secondary electrons are also reported. (Auth.).

57913 **Mushy zone model with an exact solution.** Solomon, A.D.; Wilson, D.G.; Alexiades, V. (Union Carbide Corp., Oak Ridge, TN). *Letters in Heat and Mass Transfer;* 9: No. 4, 319-324(1982). Contract W-7405-ENG-26.

We propose a very simple model of a mushy zone which admits of an explicit solution. To our knowledge, it is the only instance where an actual observation of the mushy zone width and structure is used as a partial basis for the model definition. The model rests upon two unknown parameters. The first determines the relation between the equilibrium temperature gradient and the mushy zone width. The second depends upon the dendritic structure in the mushy zone, and is related to the solid fraction. Both can be estimated from experiments. We define the model, present its closed form solution, and give tables from which the solution can be found explicitly. It is seen that in most cases the predicted mushy zone is of very small width.

57914 **Expression for the vacancy-wind effect in diffusion in a binary substitutional alloy.** Murch, G.E. (Argonne National Lab., IL). *Philosophical Magazine, [Part] A: Defects and Mechanical Properties;* 46: No. 1, 151-159(1982). Contract W-31-109-ENG-38.

A general expression is derived for the vacancy-wind factor which occurs in the equation linking the intrinsic diffusion coefficient, the tracer diffusion coefficient, and the thermodynamic factor in a binary subsitutional alloy. The expression leads immediately to the binary analogue of the exact Nernst-Einstein equation derived recently by Murch in the unary system. A realization by Monte Carlo computer simulation of the expression was made for the random-alloy model. Results obtained were in excellent agreement with the results of the analysis by Manning.

6561 Superconductivity

REFER ALSO TO CITATION(S) 57300, 57345

6580 Mathematical Physics

57915 **(LBL—16632) Repeat-free sequences.** Elser, V. (Lawrence Berkeley Lab., CA (USA)). Sep 1983. Contract AC03-76SF00098. 8p. NTIS, PC A02/MF A01. Order Number DE84001348.

A special class of sequences having no adjacent repeated subsequences is discussed. It is shown that repeat-free sequences of three symbols having arbitrary length exist. Moreover, the exponential growth of the number of such sequences with their length is established.

70 FUSION ENERGY

7001 Plasma Research

REFER ALSO TO CITATION(S) 57827, 57982

57916 **(CONF-8309137—3) Inverse plasma equilibria.** Hicks, H.R.; Dory, R.A.; Holmes, J.A. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 29p. NTIS, PC A03/MF A01. Order Number DE84000723.

From 2. European workshop on computational problems in the calculation of MHD equilibria; Wildhaus, Switzerland (12 Sep 1983).

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We illustrate in some detail a 2D inverse-equilibrium solver that was constructed to analyze tokamak configurations and stellarators (the latter in the context of the average method). To ensure that the method is suitable not only to determine equilibria, but also to provide appropriately represented data for existing stability codes, it is important to be able to control the Jacobian, tilde J is identical to $\delta(R,Z)/\delta(\text{rho}, \theta)$. The form chosen is tilde J = J_0(rho)R/sup 1/rho where rho is a flux surface label, and l is an integer. The initial implementation is for a fixed conducting-wall boundary, but the technique can be extended to a free-boundary model.

57917 **(DOE/ER/53136—5) Theoretical aspects of mirror fusion. Quarterly progress report, 1 July 1983-30 September 1983.** Nicholson, D.R.; Knorr, G.E. (Iowa Univ., Iowa City (USA)). Sep 1983. Contract AC02-82ER53136. 6p. NTIS, PC A02/MF A01. Order Number DE84001074.

Summaries of work during this period are given for the following two topics: (1) leak width of a cusp confined plasma, and (2) parametric instabilities during ecrheating of tandem mirrors. (MOW)

57918 **(DOE/ER/53138—T2) Injected internal target technique, (IT)^3, for measuring the geometry of EBT rings. Final report.** (JAYCOR, Santa Monica, CA (USA)). 6 Jun 1983. Contract AC03-82ER53138. 50p. NTIS, PC A03/MF A01. Order Number DE84001429.

It was found that a diagnostic Hg beam can be used to determine the geometry and parameters of an essential element of the EBT concept, the ELMO rings. Consequently, an (IT)^3 diagnostic system would be of immense help in the EBT development program, particularly in assessing the impact of ring properties and power requirements on the overall economic feasibility of EBT reactors. The results of this study indicate strongly that an (IT)^3 system can not only measure the changes in ring geometry as the experimental parameters are varied, but also detailed spatial distributions of the temperature and density of the hot ring electrons. The (IT)^3 diagnostic system is the only method to date which appears to have the potential to perform directly these detailed measurements of the ring profiles. Furthermore, the Hg beam itself may find useful application as a heavy ion beam probe for measurements of the space potential of the confined plasma in EBT and as a tool to determine the magnetic field configuration within the ring.

57919 **(DOE/ET/52040—T17) CTR plasma engineering studies. Annual progress report, 1 November 1982-30 October 1983.** Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). 1983. Contract AC02-76ET52040. 91p. (COO—2218-295). NTIS, PC A05/MF A01. Order Number DE84001279.

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During FY 1983, much effort was devoted to work in support of alternate confinement concepts, especially those involving field reversal. This work includes: (1) study of possible steady-state operation of the Reversed Field Pinch (RFP) via driven dynamo action, (2) the development of particle and energy confinement scaling for the RFP and the Field Reversed Theta Pinch (FRTP), and (3) analysis of start-up (heating and plasma build) for the spheromak and Field Reversed Mirror (FRM). In addition, a block of projects were concerned with fusion product heating and the possible effects of fusion product-driven instability. These include: (1) effects of alpha-driven microinstabilities on heating in tokamaks, (2) exploratory studies of loss-cone-driven fusion product instabilities in tandem mirrors, and (3) fusion product transport, including effects of large angle scattering in reversed field devices such as the FRM.

57920 **(DOE/ET/53006—8) Extreme-ultraviolet and soft x-ray diagnostics of high-temperature plasmas. Annual progress report, October 1, 1981-September 30, 1983.** Moos, H.W.; Armstrong, L. Jr. (Johns Hopkins Univ., Baltimore, MD (USA)). 1983. Contract AC02-76ET53006. 15p. NTIS, PC A02/MF A01. Order Number DE84001263.

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A comprehensive program to develop extreme ultraviolet and soft x-ray diagnostics for magnetically confined plasmas is described. An instrument for measuring the location and distribution of impurities near the plasma core with $\sim$ 5 ms time resolution is under development. The results of evaluation tests for other new spectroscopic diagnostics on plasma devices in the DOE laboratories are described. Supporting laboratory studies and ionic structure calculations are also discussed.

57921 **(INIS-mf—8196) Time-resolved Thomson scattering diagnostics using a periodically emitting ruby laser.** Behn, R. (Stuttgart Univ. (Germany, F.R.)). 14 Feb 1980. 90p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83781088.

A method is presented to control the emission of a ruby laser. This method allows one to reduce the duty factor without any reduction of the mean power. With respect to future applications, the design goal was to obtain equidistant pulses of a given repetition rate. To take full advantage of a periodically pulsed laser system for the scattering diagnostics, an appropriate method has to be developed for the electronic treatment of the detector signal. Finally this method of time-resolved scattering diagnostics has been tested by measurements with a 200 A carbon arc. Based on this study an extrapolation shows, that, using a ruby laser system for the measurement of density and temperature of a Tokamak plasma, a time resolution better than 100 μs should be possible. This could be confirmed by application of the method in the PULSATOR Tokamak at the Plasma Physics Institute MPI in Garching.

57922 **(IPP—1/210) Experiments with nuclear track detectors for diagnostics of protons and alpha particles from fusion plasmas.** Muehling, E. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Oct 1982. 66p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751276.

This report deals with the experimental development of a method of detecting charged particles from nuclear fusion plasmas by means of nuclear track detectors. The latter were bombarded with protons and alpha particles poduced with an accelerator from the fusion reactions D (^{3}He, p) α and D (D, p) T. In the parameter range expected for the particles emitted from thermonuclearly burning plasma the detection probabilities of protons and alpha particles were determined as functions of the energy and angle of incidence, and also the crater radii and depths as functions of the particle species, particle energy and etching time. The following results were obtained: For alpha particles the detection probability in the entire energy range investigated and at angles of incidence between 0° and 70° to the foil normal is about 100%. The alpha particle energy can be approximately determined from the track depths. For protons, on the other hand, the detection probability already decreases monotonically at low energies as the energy increases, becoming zero at about Esub(p) = 7 MeV. Proton detection is only possible at angles of incidence between 0° and 30°. The proton energy can be approximately determined from the track radii. The measured energy dependence of the track radii and depths of alpha particles and protons and their angular dependence can be explained with a simple model calculation in which it is assumed that the track etching rate decreases as the particle range in the material of the nuclear track foils increases.

57923 **(IPP—1/212) Broadband crystal spectrometer for the non-active and active phases of JET.** Engelhardt, W.; Fink, J.; Fussmann, G.; Krause, H.; Schilling, H.B.; Schumacher, U. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Mar 1982. 39p. (IPP—III/81). NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751109.

Reprint of IPP-JET-report No. 5.

The design study treats the possibilities of quantitatively measuring the Soft X-ray spectrum of JET with a double crystal spectrometer device in parallel mode. This spectrometer type is much suited for broad band soft X-ray spectroscopy, also - due to its folded optical pathway - during D-T operation of JET; the expected detector count rates are far above the background level. Methods to fulfill the important condition of parallel orientation of the two crystals, to shield the device against neutrons and gamma rays, to obtain spectral resolution sufficient for spectral line profile measurements and to upgrade the device for continuous spatial scanning of the JET plasma are presented.

57924 **(IPP—2/263) Calculation of electron cyclotron emission line profiles for the W VII-A stellarator plasma.** Zhang, Z.X. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Aug 1982. 29p. NTIS (US Sales Only), PC A03/MF A01. Order Number DE83751277.

A three-dimensional ray-tracing code for the stellarator plasma is worked out. By an integration along its trace the ECE line profiles at the second harmonic for different W VII-A plasma parameters are calculated. Attention is paid especially to which line profile should be recorded by the diagnostics, the influence of the finite aperture of the antenna, the wave polarization and wall reflection are studied. The reliability of measuring temperature profiles by ECE line shape is discussed. The code can be used to calculate the expected ECE spectrum.

57925 **(IPP—6/215) High β and toroidal effects on the internal kink mode in tokamaks.** Schmalz, R. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Sep 1982. 55p. NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751278.

The inclusion of high-β and first-order toroidal terms in the reduced set of (resistive) MHD equations affords the possibility of improving the study of tokamak plasma behaviour by three-dimensional numerical simulation. A new code, GALA, based on the reduced equations is developed. It is used to analyse the linear and nonlinear behaviour of the internal kink mode in equilibria which are generated by a simple relaxation procedure. We find that the inclusion of toroidal effects in high-β equilibria provides considerable stabilization.

57926 **(LA-UR—83-2580) Energetic plasma-beam propagation in weak and strong magnetic fields.** Shanahan, W.R. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830911—24). NTIS MF A01. Order Number DE84001362.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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Dynamical aspects of a relativistic plasma beam propagating across a magnetic field are investigated through two- and three-dimensional particle-in-cell numerical simulations. In the two-dimensional simulations, different aspects of the physics are revealed by placing the initial ambient field perpendicular to and within the plane of calculation. In the former case the expected beam polarization appears at early times in the simulations but is quickly dominated by collectively induced heating. In the second geometry effects of magnetic field deformation appear. The consequences of allowing variation in the third dimension are briefly discussed.

57927 **(LA-UR—83-2670) Space-time evolution of the nonlinear two-stream instability.** Lemons, D.S.; Jones, M.E.; Lee, H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830911—30). NTIS, PC A02/MF A01. Order Number DE84001336.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

A cold electron beam penetrating a cold plasma is electrostatically unstable. The instability produces a growing electric field that saturates when the beam electrons are suddenly trapped by a single wave. During trapping a significant amount of energy is transferred from the beam to the field and ultimately to the plasma. At Los Alamos experiments are being performed that demonstrate this anomalous beam-driven plasma heating. The heating efficiency is a function of the phase velocity of the trapping wave. According to our generalization of a previous calculation, the instability is absolute and its wave form evolves in both space and time. Modifying trapping theory to account for the space and time evolution of the two-stream instability, we find that the heating efficiency should change in time. This prediction is in agreement with results from one-dimensional PIC simulations.

57928 **(LA-UR—83-2671) Filamentation instability of ion acoustic waves driven by a scattered relativistic beam.** Lee, H.; Jones, M.E. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830911—29). NTIS, PC A02/MF A01. Order Number DE84001323.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

Ion-acoustic instability driven by a scattered relativistic beam propagating in a plasma of hot electrons and cold ions is investigated. We have derived a fully electromagnetic dispersion relation and its cold beam limit and discussed the general features of the growth rate spectrum. We find that this instability is sensitively damped by th beam temperature. Particle trapping and nonlinear growth are studied by using particle-in-cell simulations.

57929 **(ORNL/TM—8750) Experimental results on finite-beta limits and transport in the ISX-B tokamak.** Bates, S.C.; Bush, C.E.; Carreras, B.A.; Cooper, W.A.; Dunlap, J.L.; Edmonds, P.H.; Eldridge, O.C.; England, A.C.; Gardner, W.L.; Hogan, J.T. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 53p. NTIS, PC A04/MF A01. Order Number DE84000258.

A summary of experimental results pertaining to plasma energy and particle transport in the Impurity Study Experiment (ISX-B) tokamak is presented. Emphasis is placed on results with neutral beam heating, usually in the co- direction (aligned with the plasma current), and the relative roles of various energy loss mechanisms are discussed. The derived electron thermal diffusivity and

the predictions of various models have been compared. The measured values are within a factor of 2 of the values expected to result from resistive pressure-driven modes. Evidence for the presence of these modes is discussed. Values of ion thermal diffusivity are compared with the predictions of neoclassical theory. Anomaly factors (the ratio of experimental value to theoretical value) between 1 and 5 are found. Comparisons between experimental results and theoretical predictions are also made for cases with increased toroidal field ripple, produced by using only 9 of the 18 toroidal field coils. Convection is shown to play a small role in energy transport, except at the plasma periphery. The behavior of both plasma and impurity particles is discussed and shown to be strongly dependent on the direction of the plasma current relative to the neutral beam (coinjection and counterinjection). Beta limits are discussed. The maximum values obtained for both β/sub I/ ($\sim$ 2) and $<\beta>$ ($\sim$ 2.5%) are not thought to be limited except by the restricted power available for heating.

57930 **(ORNL/TM—8806) Ambipolarity and transport with resonant ion diffusion in EBT.** Jaeger, E.F.; Hedrick, C.L.; Hastings, D.E.; Tolliver, J.S. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 33p. NTIS, PC A03/MF A01. Order Number DE84000333.

Using recently derived analytic expressions for resonant and nonresonant neoclassical transport coefficients in EBT, we calculate the ambipolar potential required to maintain quasi-charge neutrality in the presence of a high-energy ion tail produced by nonclassical heating. The electric field obeys a differential rather than an algebraic equation. Solution of this equation gives a potential proportional to the local magnetic field strength and thus a rigid rotation of low-energy ions near the magnetic axis. Radial-transport calculations using this potential give improved agreement with experimental data for neutral density and particle lifetime. However, high-energy ion orbits in the calculated potential exhibit banana widths larger than assumed in the resonant transport theory. The required density of high-energy ions is therefore larger than would be expected if realistic banana widths could be included.

57931 **(ORNL/TM—8815) Ion-beam surface analysis in plasma-edge studies.** Zuhr, R.A.; Roberto, J.B.; Appleton, B.R. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 126p. NTIS, PC A07/MF A01. Order Number DE84001578.

The application of ion-beam surface-analysis techniques to plasma-edge studies in fusion devices is reviewed. Methods of ion beam analysis are described for the quantitative determination of the species, concentration, and depth distribution of atoms collected on surface probes or other exposed surfaces in the plasma edge. The interpretation of these data in terms of plasma-edge parameters such as particle fluxes and energies and surface modification is discussed. Plasma-edge experiments using ion-beam surface analysis are reviewed and compared with techniques involving other surface spectroscopies and electrical and optical probes.

57932 **(SAI—83-1014/PRI-63) Electron-cyclotron maser and whistler instabilities in a relativistic electron plasma with loss-cone distribution.** Tsang, K.T. (Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.). Sep 1983. Contract AC03-76ET53057. 28p. NTIS, PC A03/MF A01. Order Number DE84001607.

The electron-cyclotron maser and whistler instabilities are investigated in a unified treatment. The dispersion relation is solved numerically and extensive parametric studies are performed. We find that growth rates for both instabilities increase with perpendicular hot-electron temperature and the size of the loss cone.

57933 **(SAI—83-1034/PRI-65) Resonant-three-wave mode coupling in inhomogeneous plasmas: symmetry breaking by ω/sub */.** Myra, J.R.; D'Ippolito, D.A. (Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.). Aug 1983. Contract AC03-76ET53057. 21p. NTIS, PC A02/MF A01. Order Number DE84001633.

The general-frequency gyrokinetic formalism is used to obtain expressions for the electrostatic flute mode resonant-three-wave coupling coefficients in a warm magnetized plasma with a cross-field density gradient. In the infinite homogeneous plasma limit, the coefficients assume a particularly simple form which is manifestly symmetric under all permutations of the three waves. This symmetry is broken for the inhomogeneous case when ω/sub */ terms are retained. As a consequence, it is shown that three ion Bernstein modes can satisfy the conditions for explosive instability.

57934 **Statistical magnetohydrodynamics and reversed-field-pinch quiescence.** Turner, L. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 23-33(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

Also published as report LA-UR--82-1358, 1982.

A statistical model of a bounded, incompressible, cylindrical magnetofluid is presented. This model predicts the presence of magnetic fluctuations about a cylindrically-symmetric, Bessel-function-model, mean magnetic field, which satisfies $\Delta x<B>=\mu<B>$. As THETA->1.56, the model predicts that the significant region of the fluctuation spectrum narrows down to a single (coherent) m=1 mode. An analogy between the Debye length of an electrostatic plasma and μ^{-1} suggests the physical validity of the model's prediction of <deltaB(r)deltaB(r')> when vertical stroker-r'vertical stroke>$=\mu^{-1}$.

57935 **Recent results of OHTE experiments.** Goforth, R.; Carlstrom, T.; Chu, C.; Jackson, G.; La Haye, R.; Ohkawa, T.; Schaffer, M.; Tamano, T.; Taylor, P.; Brooks, N.H. (General Atomic Co., San Diego, CA (USA)). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 87-92(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

OHTE reversed-field configurations with separatrix were produced, and high-beta confinement observed. Magnetic measurements identified m=1 and m=0 activity in both OHTE and RFP discharges, and anti B/Bapprox.=Ssup(-1/2). After careful adjustment of applied vertical field, both OHTE and RFP discharges were sustained well beyond the resistive decay or configuration time.

57936 **Compact toroid experiments: Spheromaks and field-reversed configurations.** Quinn, W.E. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 121-127(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

With 37 refs.; Also published as report LA-UR--82-1397, 1982.

Compact toroids (CT) containing both poloidal and toroidal magnetic field, spheromaks, are generated in the CTX experiment using a magnetized coaxial plasma gun, and are trapped and stably confined in an oblate flux conserver. Total configuration lifetimes are observed up to approx.=0.8 ms, consistent with classical resistive decay. The field reversed configuration (FRC) is a high beta, axisymmetric, highly prolate compact toroid, containing only poloidal magnetic field, formed in a field-reversed theta pinch. A quiescent confinement period of 30 to 90 μs with Tsub(i)approx.=200-500 eV and n-5×10^{15} cm^{-3} is terminated by an n=2 rotational instability. The FRC is stable to MHD modes including the tilting instability.

57937 **Experimental spheromak MHD stability studies.** Goldenbaum, G.C.; Bruhns, H.; Chin-Fatt, C.; Chong, Y.P.; DeSilva, A.W.; Griem, H.R.; Hart, G.W.; Hess, R.A.; Irby, J.H.; Shaw, R.S. (Maryland Univ., College Park (USA). Lab. for Plasma and Fusion Energy Studies). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 129-133(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

The n=1 tilt and radial shift instability of spheromaks is shown to be stabilized by the use of conducting wall (rsub(w)/rsub(s)=1.2) and stabilization coils.

57938 **Recent results on dense Z pinches.** Hammel, J.E.; Scudder, D.W.; Schlachter, J.S. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 161-168(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

A detailed description of the ongoing high density Z-pinch experiments at Los Alamos is given. A review of past dense experiments is included. A model for a dense Z pinch as a high-Q, low yield, reactor system is presented.

57939 **High beta multipoles.** Prager, S.C. (Wisconsin Univ., Madison (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 187-196(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

Also published as report DOE/ET/53051--37, May 1982.

Multipoles are being employed as devices to study fusion issues and plasma phenomena at high value of beta (plasma pressure/magnetic pressure) in a controlled manner. Due to their large volume, low magnetic field (low synchrotron radiation) region, they are also under consideration as potential steady state 'advanced fuel' (low neutron yield) reactors. Present experiments are investigating neoclassical ('bootstrap' and 'Pfirsch-Schlueter') currents and plasma stability at extremely high beta.

57940 **Surface magnetic confinement in toroidal and linear mirror systems.** Wong, A.Y.; Dimonte, G.; Ferron, J.R.; Fukao, M.Y.; Jones, K.; Kuthi, A.; Lam, K.L.; Leikind, B.J.; Schumacher, R.W.; Stephanian, H. (California Univ., Los Angeles (USA). Dept. of Physics). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 207-221(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

Plasma confinement by surface magnetic (SURMAC) fields is presented for toroidal multipole and linear magnetic mirror systems. The toroidal system is the Dodecapole Surmac device where stable confinement of high temperature (Tsub(i)approx.=500 eV), high density (napprox.=10^{13} cm^{-3}), and high β (approx.=8%) plasma is demonstrated. No ballooning mode exists even at β=8% and the plasma is stable. Guarding of internal hoop supports is investigated and the main loss area is around the field null, with a width of approx.=2rhosub(ci). The loss through a guarded support is estimated to be 2.5% of an unguarded one.

57941 **High-power-density approaches to magnetic fusion energy: Problems and promise of compact reversed-field pinch reactors (CRFPR).** Hagenson, R.L.; Krakowski, R.A.; Dreicher, H. (Los Alamos National Lab., NM (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 241-252(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

With 35 refs.; Also published as report LA-UR--82-1480, 1982.

If the costing assumptions upon which the positive assessment of conventional large superconducting fusion reactors are based proves overly optimistic, approaches that promise considerably increased system power density and reduced mass utilization will be required. These more compact reactor embodiments generally must operate with reduced shield thickness and resistive magnets. Because of the unique magnetic topology associated with the Reversed-Field Pinch (RFP), the compact reactor embodiment for this approach is particularly attractive from the viewpoint of low-field resistive coils operating with ohmic losses that can be made small relative to the fusion power. The RFP, therefore, is used as one example of a high-power-density (HPD) approach to magnetic fusion energy. A comprehensive system model is described and applied to select a unique, cost-optimized design point that will be used for a subsequent conceptual engineering design of the compact RFP Reactor (CRFPR). This cost-optimized CRFPR design serves as an example of a HPD fusion reactor that would operate with system power densities and mass utilizations that are comparable to fission power plants, these measures of system performance being an order of magnitude more favorable than the conventional approaches to magnetic fusion energy (MFE).

57942 **Beta enhancement by relativistic electron rings in bumpy tori.** Kammash, T.; Nguyen, K.T. (Michigan Univ., Ann Arbor (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 263-266(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

The maximum achievable beta (ratio of plasma pressure to magnetic pressure) value in a bumpy torus such as Elmo (EBT) is determined primarily by the stability of the system to the interchange modes. These modes have as their source of free energy the drifts of the hot electron component that arise from the curvature and gradients of the confining magnetic field. At low (compared to the ion gyro) frequencies the only modes that exist are the core plasma and hot electron interchange, but at frequencies near the ion cyclotron frequency, instabilities arising from coupling of the interchange and compressional Alfven wave also appear. In most, if not all previous treatments of these instabilities, the hot electrons were treated as non-relativistic. In this paper we re-examine these modes using a relativistic formulation for the hot electrons which we also treat as highly anisotropic by neglecting their parallel momenta relative to the perpendicular momenta and their rest mass energy. We find a significant enhancement in the ion beta value as a result of treating the ring electrons relativistically. For typical present day EBT parameters we find that the value of the ion beta increases by about 50% as a result of increasing the hot electron mean energy from about several keV to few MeV. At such an energy the microwave power for heating these electrons is also optimum since the drag on the background plasma also reaches its minimum value.

57943 **EBT stability theory.** Berk, H.L.; Van Dam, J.W.; Rosenbluth, M.N. (Texas Univ., Austin (USA). Inst. for Fusion Studies); Spong, D.A. (Oak Ridge National Lab., TN (USA)); Cheng, C.Z. (Princeton Univ., NJ (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 267-270(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

The theory of unfavorable curvature-driven instabilities is developed for a plasma interacting with a hot electron ring whose drift frequencies are larger than the growth rates predicted from conventional magnetohydrodynamic theory. A Z-pinch model is used to emphasize the radial structure of the problem. Stability criteria are obtained for the five possible modes of instability: The conventional hot electron interchange, a high-frequency hot electron interchange (at frequencies larger than the ion-cyclotron frequency), a magnetic compressional instability, a background pressure-driven interchange, and an interacting pressure-driven interchange. The effect of F.L.R. stabilization on the low-frequency modes (less than the ion-cyclotron frequency) will be discussed.

57944 **Ion heating and containment in an electric field bumpy torus (EFBT) plasma.** Roth, J.R. (Tennessee Univ., Knoxville (USA)). *Nuclear Instruments and Methods in Physics Research;* 207: No. 1/2, 271-299(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

With 50 refs.

In the Electric Field Bumpy Torus (EFBT), gross confinement is provided by a bumpy torus magnetic field, and plasma heating, macroscopic stabilization, and enhanced confinement by externally applied electric fields. In this magneto-electrically confined plasma, the radial electric field has exceeded 1 kV/cm at the plasma boundary and has penetrated inward to a least one-half the plasma radius.

57945 **Simulation of plasma double-layer structures in two dimensions.** Borovsky, J.E.; Joyce, G. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). *Journal of Plasma Physics;* 29: 45-84(Feb 1983).

Electrostatic plasma double layers are numerically simulated by means of a magnetized two-and-a-half-dimensional particle-in-

cell method, periodic in one direction and bounded by reservoirs of Maxwellian plasma in the other. A simplified one-dimensional model of oblique plasma double layers, using water-bag velocity distribution functions, is presented.

57946 **Finite-beta and curvature drift effects on drift waves near the plasmapause.** Migliuolo, S.; Patel, V.L. (Denver Univ., CO (USA). Dept. of Physics). *Journal of Plasma Physics;* 29: 85-97(Feb 1983).

The linear stability of finite-β drift waves, near the plasmapause of the earth, is analysed for the case in which the magnetic field is non-uniform in two dimensions. The coupling of the driftwave to the oscillation of the magnetic field, due to non-zero β, is found to be destabilizing. The spatial structure of the unstable mode is found to be governed by the 'curvature' scale length of the equilibrium magnetic field.

57947 **Variational principles of guiding centre motion.** Littlejohn, R.G. (California Univ., Los Angeles (USA). Dept. of Physics). *Journal of Plasma Physics;* 29: 111-125(Feb 1983).

An elementary but rigorous derivation is given for a variational principle for guiding centre motion. The equations of motion resulting from the variational principle (the drift equations) possess exact conservation laws for phase volume, energy (for time-independent systems), and angular momentum (for azimuthally symmetric systems). The results of carrying the variational principle to higher order in the adiabatic parameter are displayed. The behaviour of guiding centre motion in azimuthally symmetric fields is discussed, and the role of angular momentum is clarified. The application of variational principles in the derivation and solution of gyrokinetic equations is discussed.

57948 **Resistive instabilities in tokamak geometry.** Grimm, R.C.; Dewar, R.L.; Manickam, J.; Jardin, S.C.; Glasser, A.H.; Chance, M.S. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 35-47 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/P-2-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

A numerical program has been carried out to study resistive instabilities in a finite pressure, axisymmetric toroidal configuration. The approach is a generalization of the boundary layer matching method to a torus, involving calculation of marginally stable solutions of the ideal MHD Euler-Lagrange equations, solution of the scalar resistivity boundary layer equations, and complex root-finding techniques for the solution of the dispersion relation for the normal modes. In zero pressure systems it is found that toroidicity and non-circularity can stabilize the m=2 tearing mode. At finite β the nature of the solutions is illustrated and the stabilization at small values of resistivity is confirmed for systems with negative Dsub(R).

57949 **MHD activity and neutral-beam-driven transport effects in ISX-B tokamak.** Carreras, B.A.; Isler, R.C.; Dunlap, J.L. (Oak Ridge National Lab., TN (USA)). pp 77-89 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/P-4).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

In the first part of the paper the equilibrium and MHD stability studies for ISX-B plasmas are described. Present results indicate that ISX-B equilibria are marginally stable to ideal MHD modes. The resistive MHD model can explain the dominant role of the n=1 mode and its changing behaviour with increasing βsub(p). Resistive balloon/sub g modes could be responsible for the long frequency tail of B-tilde fluctuations and cause the confinement deterioration observed in ISX-B. The second part of the paper describes beam effects. Unidirectional neutral-beam injection, such as employed on ISX-B, is also expected to alter the particle and energy confinement because of the net momentum transfer and the accompanying plasma rotation. Such beam-dependent modifications to standard neoclassical processes are observed in the impurity transport at measured central, toroidal rotation velocities in the range of 10^6 to 10^7 cm.s^{-1}.

57950 **Confinement and heating in modular and continuous coil stellarators.** Anderson, D.T.; Anderson, F.S.B.; Bonomo, R.L. (Torsatron/Stellarator Lab., Wisconsin Univ., Madison (USA)) . pp 105-114 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/Q-2).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Major efforts on the Proto-Cleo stellarator have focused on ICRH of a net current-free plasma, measurements of plasma secondary currents, RF heating by externally induced magnetic reconnection through the formation and destruction of an internal separatrix, and RF current drive experiments. Efforts on the Proto-Cleo torsatron have focused on electron heat conduction. A modular stellarator has been designed and is under fabrication at the University of Wisconsin. The Interchangeable Module Stellarator (IMS) is designed to approximate closely the magnetic properties of the existing Proto-Cleo stellarator as much as possible. Monte-Carlo transport calculations have been made in flux coordinates using model fields patterned after magnetic fields in Proto-Cleo and IMS. Plasma simulation techniques using a 2.5-dimensional particle-in-cell method have been utilized in a numerical search for the bootstrap current. A current is found which is proportional to temperature and density gradients but is independent of poloidal field. The behaviour of charged particles moving in a stellarator under the influence of a steady magnetic field is analysed in terms of the Hamiltonian of the moving particle and the technique of repeated canonical transformations to identify possible adiabatic invariants and drift motions. An improved theory of collisionless particle motion in stellarators has been developed for a family of stellarator configurations. The broad range of configurations encompassed by this family permits an understanding of the differences in numerically observed transport coefficients. Two procedures have been developed to calculate the bootstrap current in non-axisymmetric stellarators. In fully toroidal stellarators the flows and consequent bootstrap current are reduced from their axisymmetric values by a factor of order l slash-l/m in the Pfirsch-Schlueter regime.

57951 **Particle transport due to ICRF waves and radial electric fields in tokamaks.** Taylor, R.J.; James, B.W.; Jin, S.X. (California Univ., Los Angeles (USA)). pp 251-261 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/S-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Induced transport was studied in Macrotor during RF heating, electron injection, and electron and ion extraction by biased limiter-like electrodes. Extensive studies were made of mode-converted short-scale ICRF waves, drift waves and ICRF-induced fast ions. These phenomena were found to play no role in the transport. The DC radial electric field, in the sense that it represents potential energy, appears to be the direct cause of enhanced transport. A negative plasma accumulates both majority and impurity ions. In this case, impurity radiation dominates the energy balance. On the other hand, a positive plasma recycles ions at the edge and the energy balance is dominated by edge convection. In Macrotor the particle confinement time and the radiated power loss has been

varied by a factor of 100 (by DC fields), leaving very little range for other phenomena to play a comparable role in particle transport.

57952 Finite-β regimes and transport processes in thermonuclear plasmas. Coppi, B.; Pegoraro, F. (Scuola Normale Superiore, Pisa (Italy)); Bonoli, P.T.; Crew, G.B.; Englade, R.; Ramos, J.J.; Sharky, N.; Sugiyama, L. (Massachusetts Inst. of Tech., Cambridge (USA)). pp 307-318 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/W-2).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

A "second stability region" for internal kink modes, characterized by poloidal wave numbers $m^0 = 1$, has been found in finite-β axisymmetric configurations. This makes it possible to envision a broad class of heating cycles from low-β to high-β regimes that maintain complete ideal MHD stability for both ballooning and internal kink modes. These heating cycles can be viewed as a sequence of equilibria of which the first part, which involves a relatively fast temperature rise, preserves the magnetic flux. In the second part the flux conservation is allowed to relax and the field "twist parameter" slash-l(psi) to become larger than unity over a considerable portion of the plasma column. The problem of confinement of energetic fusion reaction products and of the possible influence of the collective modes that can be excited by them in finite-β regimes where ideal MHD ballooning modes are stable also leads to rather optimistic conclusions. In fact, the "shear Alfven" type of perturbations from which ballooning modes evolve do not appear as normal modes in realistic toroidal equilibrium configurations. The rate of electron energy transport found in Ohmic-heated experiments is compared with that observed in experiments where injected heating prevails. An analytic expression for the relevant diffusion coefficient is given which is found to reproduce well both the electron temperature profiles and the limited number of experiments whose energy balance has been analysed so far. A 1-D transport code that reproduces the energy confinement times for temperature and density oscillations corresponding to the well known sawtooth oscillations observed in current experiments has been developed. This code has been used to predict the time-dependent rate of fusion reactions for near-term experiments such as Ignitor which should test the α-particle heating of D-T plasmas.

57953 Confinement in toroidal systems with partially destroyed magnetic surfaces. White, R.B.; Boozer, A.H.; Goldston, R.; Hay, R.; Albert, J.; Karney, C.F.F. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 391-400 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/T-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

A Hamiltonian formulation of the guiding centre drift equations valid for stochastic fields is given. Modification of neoclassical transport due to imperfect magnetic surfaces is investigated numerically. For banana-trapped particles a discrete map representation is given for the orbits and used to study loss of banana-trapped α-particles due to field ripple.

57954 Non-linear g modes in the RFP and possible relationships to energy confinement. Hender, T.C. (Oak Ridge National Lab., TN (USA)); Robinson, D.C. (Euratom/UKAEA Fusion Association, Abingdon (UK). Culham Lab.). pp 417-425 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/T-5).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

A spectral Fourier code for studying resistive g modes in the Reverse Field Pinch (RFP) is described. The results of a mixed helicity simulation show that ergodic field line behaviour occurs as a consequence of the interaction of g modes with varying helicity. The possible relationships of this ergodicity to energy containment in the RFP are considered.

57955 Curvature-driven instabilities in the Elmo Bumpy Torus. Abe, H.; Berk, H.L.; Cheng, C.Z. (Texas Univ., Austin (USA). Inst. for Fusion Studies). pp 427-441 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/T-6-1).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Curvature-driven instabilities are analysed for an Elmo Bumpy Torus (EBT) configuration which consists of plasma interacting with a hot electron ring whose drift frequencies are larger than the growth rates predicted from conventional MHD theory. Stability criteria are obtained for five possible modes: the conventional hot electron interchange, a high-frequency hot electron interchange (at frequencies greater than the ion-cyclotron frequency), a compressional instability, a background plasma interchange, and an interacting pressure-driven interchange. A wide parameter regime for stable operation is found which, however, severely deteriorates for a band of intermediate mode numbers. Finite Larmor radius effects can eliminate this deterioration; moreover, all short-wavelength curvature-driven modes are stabilized if the hot electron Larmor radius rhosub(h) satisfies (ksub(perpendicular)rhosub(h))^2 > (2Δ/Rβsub(h))(1+P'sub(parallel)/P'sub(perpendicular)), where ksub(perpendicular) is the transverse wavenumber, Δ is the ring half-width, R is the mid-plane radius of curvature, βsub(h) is the hot electron beta value, and P' is the pressure gradient. Resonant wave-particle instabilities predicted by a new low-frequency variational principle show that a variety of remnant instabilities may still persist.

57956 Summary on magnetic confinement experiments. Furth, H.P. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 451-466 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The present summary covers the tokamak work performed these last four years and presents highlights of progress in other areas (tandem mirror machines, Elmo Bumpy Tori, stellarators, reverse-field pinches, compact tori).

57957 Grid launched linear and nonlinear ion-acoustic waves. Lonngren, K.E.; Khazei, M.; Gabl, E.F. (Iowa Univ., Iowa City (USA). Dept. of Electrical and Computer Engineering); Bulson, J.M. (Iowa Univ., Iowa City (USA). Dept. of Physics and Astronomy). *Plasma Physics;* **24**: No. 12, 1483-1489(Dec 1982).

A series of experiments is described on grid excited linear and nonlinear ion acoustic waves. A multiple ion-acoustic shock formation is simulated. The excitation of solitons or a dispersing wave train can be used as a plasma diagnostic. Electrostatically coupled excitation of pseudowaves is observed.

57958 **Collision data for diagnostics of magnetically confined plasmas.** Katsonis, K. (International Atomic Energy Agency, Vienna (Austria). Atomic and Molecular Data Unit; International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

The use of atomic collisions data for diagnostics of magnetically confined plasmas is briefly reviewed; the availability of these data is presented. Data useful for beam heating and modelling are also considered. Priorities are suggested for the most needed data.

57959 **Memory effects and cleaning of plasma tubes.** Lergon, H.G.; Mueller, K.G. (Essen Univ. (Gesamthochschule) (Germany, F.R.)). pp vp of SASP '82: Symposium on atomic and surface physics. Contributions. Lindinger, W.; Howorka, F.; Maerk, T.D.; Egger, F. (Innsbruck Univ. (Austria). Inst. fuer Atomphysik). Innsbruck, Austria; Institute fuer Atomphysik (1982). (CONF-820258—; INIS-mf—7893).

From Symposium on atomic and surface physics; Maria Alm/Salzburg, Austria (7 Feb 1982).

An argon plasma with a small admixture of H_2O or O_2 shows a memory effect in which material of the wall or material deposited there by previous discharges is released into the plasma. In contrast to the common cleaning of metallic surfaces with a hydrogen discharge cleaning of glass surfaces with an oxygen discharge is proposed. The enrichment of special impurity species in front of a wall is discussed.

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REFER ALSO TO CITATION(S) 57294, 57295, 57296, 57297, 57298, 57299, 57302, 57303, 57347, 57348, 57355, 57383, 57507, 57547, 57950

57960 **(BNL—33701) HYFIRE II: fusion/high-temperature electrolysis conceptual-design study. Annual report.** Fillo, J.A. (ed.). (Brookhaven National Lab., Upton, NY (USA)). Aug 1983. Contract AC02-76CH00016. 141p. NTIS, PC A07/MF A01. Order Number DE84001475.

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As in the previous HYFIRE design study, the current study focuses on coupling a Tokamak fusion reactor with a high-temperature blanket to a High-Temperature Electrolyzer (HTE) process to produce hydrogen and oxygen. Scaling of the STARFIRE reactor to allow a blanket power to 6000 MW(th) is also assumed. The primary difference between the two studies is the maximum inlet steam temperature to the electrolyzer. This temperature is decreased from ~ 1300° to ~ 1150°C, which is closer to the maximum projected temperature of the Westinghouse fuel cell design. The process flow conditions change but the basic design philosophy and approaches to process design remain the same as before. Westinghouse assisted in the study in the areas of systems design integration, plasma engineering, balance-of-plant design, and electrolyzer technology.

57961 **(CONF-820948—13) Proposed rf-technology R and D plan for the United States.** Becraft, W.R.; Eldridge, O.C.; Haselton, H.H.; Huffman, D.J.; Ponte, N.S.; Haas, G.M.; Kortman, P.J. (Oak Ridge National Lab., TN (USA); General Electric Co., Oak Ridge, TN (USA); USDOE, Washington, DC; Science Applications, Inc., Gaithersburg, MD (USA)). 1983. Contract W-7405-ENG-26. 5p. NTIS, PC A02/MF A01. Order Number DE84000643.

From 12. symposium on fusion technology; Juelich, F.R. Germany (13 Sep 1982).

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The planned use of rf energy in the US magnetic-confinement devices has increased significantly in the past few years. An attendant growth in programs to develop rf technology to support physics experiments and to prepare for future reactor-like machines is needed. This paper summarizes a draft of a proposed plan, with emphasis on the 1983 program, as prepared with the assistance of US laboratories, universities, and industries with major involvement in rf uses for fusion. The major efforts in 1983 include: specific coupler development, design and fabrication of test facilities, and the detailed assessment of the need for higher-power-component developments.

57962 **(CONF-830942—17) Organic materials for fusion-reactor applications.** Hurley, G.F.; Coltman, R.R. Jr. (Los Alamos National Lab., NM (USA); Oak Ridge National Lab., TN (USA)). Sep 1983. Contract W-7405-ENG-26. 12p. NTIS, PC A02/MF A01. Order Number DE84000337.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Organic materials requirements for fusion-reactor magnets are described with reference to the temperature, radiation, and electrical and mechanical stress environment expected in these magnets. A review is presented of the response to gamma-ray and neutron irradiation at low temperatures of candidate organic materials; i.e. laminates, thin films, and potting compounds. Lifetime-limiting features of this response as well as needed testing under magnet operating conditions not yet adequately investigated are identified and recomendations for future work are made.

57963 **(CONF-830942—20) Practical sublimation source for large-scale chromium gettering in fusion devices.** Simpkins, J.E.; Emerson, L.C.; Mioduszewski, P.K. (Oak Ridge National Lab., TN (USA)). 1983. Contract W-7405-ENG-26. 14p. NTIS, PC A02/MF A01. Order Number DE84000724.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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This paper describes the technique of chromium gettering with a large-scale sublimation source which resembles in its design the VARIAN Ti-Ball. It consists of a hollow chromium sphere with a diameter of approximately 3 cm and an incandescent filament for radiation heating from inside the ball. While the fabrication of the source is described in a companion paper, we discuss here the gettering technique. The experimental arrangement consists of an UHV system instrumented for total- and partial-pressure measurements, a film-thickness monitor, thermocouples, an optical pyrometer, and appropriate instrumentation to measure the heating power. The results show the temperature and corresponding sublimation rate of the Cr-Ball as function of input power. In addition, an example of the total pumping speed of a gettered surface is shown.

57964 **(CONF-830942—23) Recent advances in the development of solid breeder-blanket materials.** Johnson, C.E.; Hollenburg, G.W. (Argonne National Lab., IL (USA); Westinghouse Hanford Co., Richland, WA (USA)). 1983. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01. Order Number DE84000572.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Increasing attention in breeder-blanket development has been given to the lithium-containing ceramic materials. The most promising of these materials include Li_2O, Li_2ZrO_3, Li_4SiO_4, and γ-$LiAlO_2$. Recent studies have focused on Li_2O because of its high tritium breeding potential and good thermal characteristics. Tritium solubility in Li_2O is within acceptable ranges and this oxide displays excellent behavior under neutron irradiation. A broad scope of laboratory and in-reactor irradiation experiments are underway to further investigate these materials.

57965 (CONF-830942—34) Effect of implanted helium on the microstructure and creep properties of ordered $(Fe_{0.49}Ni_{0.51})_3V$ alloys. Sklad, P.S.; Schroeder, H. (Oak Ridge National Lab., TN (USA); Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Festkoerperforschung). 1983. Contract W-7405-ENG-26. 6p. NTIS, PC A02/MF A01. Order Number DE84000691.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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A series of long-range ordered alloys with base composition $(Fe_{0.49}Ni_{0.51})_3V$ were homogeneously injected with ~ 100 appm helium at 600°C using the cyclotron at the Institut fuer Festkoerperforschung (IFF), KFA Juelich, West Germany. Post-implantation creep testing at 600°C revealed that the time to rupture as well as the total creep strain was reduced drastically compared to unimplanted material. Transmission electron microscopy (TEM) revealed that while the material retained its long range order after implantation, the microstructure in the as-implanted material was characterized by a high density of faulted interstitial dislocation loops as well as a high density of cavities 2.5 to 5.0 nm in diameter. Most of the cavities were preferentially located on the faulted loops or on grain boundaries. The high angle grain boundaries also contained a large number of small vanadium carbide precipitates. It was observed that cavities on grain boundaries were smaller when associated with these precipitates. In addition a number of larger, 7 to 10 nm diameter, faceted cavities were found to be associated with antiphase domain boundaries (APBs) in the ordered microstructure. TEM was also used to investigate the details of the microstructure which developed during creep. The results indicate that the embrittlement is most likely due to the combined effect of helium at the grain boundaries and the increased resistance to deformation in the hardened matrix material.

57966 (CONF-830942—38) Measurement of the $^{27}Al(n,2n)^{26}Al$ reaction cross section for fusion-reactor applications. Smither, R.K.; Greenwood, L.R. (Argonne National Lab., IL (USA)). 1983. Contract W-31-109-ENG-38. 18p. NTIS, PC A02/MF A01. Order Number DE84000569.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

The $^{27}Al(n,2n)^{26}Al$ reaction is of considerable interest to the fusion reactor program. Aluminum is an attractive material for many structural applications, and the (n,2n) reaction is the major source of long-lived activity (^{26}Al, g.s. T/sub 1/2/ = 7.34 x 10^5 g). The threshold for this reaction falls within the spread of neutron energies generated by a D-T plasma. Its cross section is therefore a steeply rising function of energy for the primary fusion neutrons. This special feature makes it possible to use this reaction to measure plasma ion temperatures as well as neutron yields and neutron spectral shapes. The $^{27}Al(n,2n)^{26}Al$ reaction is one of the major sources of displacement damage in Al-metal alloys and other aluminum containing fusion materials, thus the cross section near threshold will strongly affect the amount of displacement damage in these materials as well as the long-lived radioactivity.

57967 (DOE/DP/40139—2) Generation and focusing of pulsed intense ion beams. Technical progress report, 1 October 1982 - 30 September, 1983. Hammer, D.A.; Kusse, B.R.; Sudan, R.N. (Cornell Univ., Ithaca, NY (USA). Lab. of Plasma Studies). Jul 1983. Contract AS08-81DP40139. 10p. NTIS, PC A02/MF A01. Order Number DE84001394.

The progress on this contract is described in three parts. The first deals with the technical operation of the LION accelerator. The second and third parts are concerned with the experimental results.

57968 (DOE/DP/40152—T2) Absolutely unstable stimulated Brillouin scattering and two-plasmon decay. Berger, D.; Powers, L. (KMS Fusion, Inc., Ann Arbor, MI (USA)). 1983. Contract AC08-82DP40152. 19p. NTIS, PC A02/MF A01. Order Number DE84000823.

57969 (DOE/DP/40152—T3) Simulations and theoretical implications of KMS transport experiments for 1.05 μm and 0.53 μm laser radiation. Fechner, W. (KMS Fusion, Inc., Ann Arbor, MI (USA)). 1983. Contract AC08-82DP40152. 20p. NTIS, PC A02/MF A01. Order Number DE84000824.

57970 (DOE/ER—0170) Background information and technical basis for assessment of environmental implications of magnetic fusion energy. Cannon, J.B. (Oak Ridge National Lab., TN (USA)). Aug 1983. Contract W-7405-ENG-26. 404p. NTIS, PC A18/MF A01. Order Number DE83018300.

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This report contains background information for assessing the potential environmental implications of fusion-based central electric power stations. It was developed as part of an environmental review of the Magnetic Fusion Energy Program. Transition of the program from demonstration of purely scientific feasibility (breakeven conditions) to exploration of engineering feasibility suggests that formal program environmental review under the National Environmental Policy Act is timely. This report is the principal reference upon which an environmental impact statement on magnetic fusion will be based.

57971 (DOE/ER/53098—2) Poloidal flux loss in a field-reversed theta pinch. Hoffman, A.L.; Milroy, R.D.; Steinhauer, L.C. (Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)). 1981. Contract AC06-80ER53098. 12p. NTIS, PC A02/MF A01. Order Number DE84001106.

Poloidal flux loss has been measured in field-reversed configurations and related to anomalous resistivity near the magnetic field null. The results indicate that mechanisms in addition to the lower-hybrid drift instability are affecting transport.

57972 (EGG-M—09283) Methodology for predicting critical-flaw sizes for the first wall of a fusion reactor. Reuter, W.G.; Merrill, B.J.; Rahl, T.E. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 7p. (CONF-830942—32). NTIS, PC A02/MF A01. Order Number DE84000804.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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Critical flaw sizes corresponding to crack penetration of the first wall are predicted using empirical equations developed for annealed stainless steel and linear elastic fracture mechanics applicable for stainless steel exposed to a fluence of 7.7 x 10^{21} n/cm^2 ($E > 14$ MeV). This fluence is based on the total fluence anticipated for INTOR. Areas where additional work is required to more accurately predict structural lifetime are discussed.

57973 (INIS-mf—8473) Second annual conference, 1981. Proceedings. McDonnel, F.N. (ed.). (Canadian Nuclear Society, Toronto, Ontario). 1981. 446p. (CONF-8106200—Pt.1). NTIS (US Sales Only), PC A19/MF A01. Order Number DE84780007.

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

Abstracts for each paper were entered into the data base. (MOW)

57974 (INIS-mf—8473, pp vp) Fusion engineering program for Canada. Billington, I.J. (DSMA Atcon Ltd., Toronto, Ontario (Canada)). [nd]. NTIS (US Sales Only), PC A19/MF A01. (CONF-8106200—Pt.1).

From 21. annual international conference of Canadian Nuclear Association and 2. annual conference of Canadian Nuclear Society; Ottawa, Canada (8 Jun 1981).

In 1980 the National Research Council asked DSMA ATCON Ltd., in collaboration with Ontario Hydro, the University of Toronto, and McMaster University, to evaluate concepts for a national fusion engineering program, to define a facility that could be constructed in Canada to meet the program goals, and to sug-

gest a strategy for encouraging industrial participation. The central element of the proposed fusion engineering and development program is tritium technology, with additional emphasis on the broader field of all hydrogen isotopes and their interactions with materials. The Canadian program in the initial phase would concentrate on fusion fuel systems, materials development, equipment development, and safety and the environment. A preliminary concept for the facility required has been developed, and key organizational activities identified. The total program costs should be $1 million in the first year, rising to a steady state of $5 million from the fourth year onward. The capital cost of the research facility is estimated to be $20 million spread over three years, and its operating budget around $7 million. The program as envisioned would make use of Canada's existing tritium resources and handling experience to contribute to worldwide fusion research.

57975 **(IPP—1/214) Equilibrium-βsub(pol)-limits in ASDEX.** Kaleck, A.; Lackner, K. (Max-Planck-Institut fuer Plasmaphysik, Garching (Germany, F.R.)). Feb 1983. 15p. (In German). NTIS (US Sales Only), PC A02/MF A01. Order Number DE83751264.

At hand of the example of ASDEX it is shown that the formulation of the high-β separatrix can be postponed to higher values of βsub(pol)/A by adjusting the curvature of the equilibrium field. Even for an approximately circular plasma cross-section this ultimately leads however to a vertical displacement instability. In ASDEX the curvature adjustment can be carried out by a non-vanishing net current in the divertor triplets, and the displacement stability can be controlled within limits by existing passive conductors and an active feedback system. Equilibrium and rigid displacement-stability calculations are presented (including the effect of different passively stabilizing elements) to study the βsub(pol)-limits set by these effects on ASDEX.

57976 **(JAERI-M—82-054) Comparison of shielding capabilities of fusion reactor blanket and shield materials.** Seki, Y.; Iida, H.; Kawasaki, H. (Japan Atomic Energy Research Inst., Tokyo). Jun 1982. 25p. NTIS (US Sales Only), PC A02/MF A01. Order Number DE83703727.

Radiation shielding capabilities of six candidate materials for the blanket and shield of a fusion reactor are compared. The six materials with widely differing nuclear characteristics, namely lead, stainless steel, heavy concrete, ordinary concrete, lithium oxide and water are selected for the comparison. The attenuation of various nuclear quantities and response values in the materials placed in a simplified model of a tokamak fusion reactor is calculated. The result of the calculations are shown graphically and compared in summary tables. Among the six materials compared, stainless steel, heavy concrete and lead are found to be the best materials for shielding the 14 MeV neutron flux, the total neutron flux and the total gamma ray flux, respectively.

57977 **(Juel—1825) Computer code PERI - permeation of hydrogen through metal membranes, release from metal surfaces and inventory in metal walls.** Wienhold, P.; Profant, M.; Waelbroeck, F.; Winter, J. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Plasmaphysik; Association Euratom-Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.)). Jan 1983. 97p. (In German). NTIS (US Sales Only), PC A05/MF A01. Order Number DE83751279.

The computer program PERI was developed as an aid to interpret experimental observations in connection with the permeation of hydrogen through metal membranes and the release of hydrogen from metal walls (Langmuir effect). Such experiments are made to find out the materials constants determining the diffusion of hydrogen as well as its solubility and release from the material. Their knowledge is indispensable for the operation of fusion plants and permits to calculate the hydrogen recycling, the inventory in the wall and the permeation (e.g. of tritium). Experiments have shown that the permeation flow density at low primary pressures (< or approx. 1 Torr) can become directly proportional to the latter and not - as Richardson's equation would lead one to expect - to the square root of the pressure. The validity of Richardson's equation, however, is frequently taken for granted when materials constants are determined.

57978 **(Juel—1827) Facilities for producing fissile fuel for high-temperature gas cooled reactors in a symbiotic fusion-fission system.** Meuresch, S. (Kernforschungsanlage Juelich G.m.b.H. (Germany, F.R.). Inst. fuer Reaktorentwicklung; Technische Hochschule Aachen (Germany, F.R.)). Jan 1983. 75p. (In German). NTIS (US Sales Only), PC A04/MF A01. Order Number DE83751284.

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In the blanket of a hybrid reactor the 14.1-MeV neutrons of the DT-fusion are used for breeding tritium and the fissile fuel U-233. Some different fertile materials are investigated. Best breeding results are achieved by using a Li-Pb-eutectic in conjunction with ThO_2 containing coated particles. The blanket region is subdevided in a 40-cm-thick breeding zone and a 59.2-cm-thick zone for fissile fuel production. A 60-cm-thick stainless-steel-boron carbide shield prevents radiation damage to the components of the superconducting magnet. The neutron and gamma-ray fluxes were calculated by solving the discrete ordinates form of the transport equation using the ANISN program in the P_3S_8 approximation in one-dimensional cylindrical geometry. The calculations for the isotope generation and depletion were performed using the ORIGEN code. Resonance calculations for Th-232 were done with the modul NITAWL of the AMPX code system. The nuclear cross sections were mainly taken from the ENDF/B-IV-Library.

57979 **(LA-UR—83-2567) Improved activation cross sections for vanadium and titanium.** Muir, D.W.; Arthur, E.D. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 7p. (CONF-830942—36). NTIS, PC A02/MF A01. Order Number DE84001400.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

Vanadium alloys such as V-20Ti and V-Cr-Ti are attractive candidates for use as structural materials in fusion-reactor blankets. The virtual absence of long-lived activation products in these alloys suggest the possibility of reprocessing on an intermediate time scale. We have employed the modern Hauser-Feshbach nuclear-model code GNASH to calculate cross sections for neutron-activation reactions in ^{50}V and ^{51}V, to allow a more accurate assessment of induced radioactivity in vanadium alloys. In addition, cross sections are calculated for the reactions $^{46}Ti(n,2n)$ and $^{48}Ti(n,2n)$ in order to estimate the production of ^{44}Ti, a 1.2-MeV gamma-ray source with a half-life of 47 years.

57980 **(LA-UR—83-2568) Evidence for a hot-electron flux limit in laser-produced plasma experiments.** McCall, G.H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 11p. (CONF-8309155—2). NTIS, PC A02/MF A01. Order Number DE84001365.

From International conference on lasers; Guangzhou, China (6 Sep 1983).

It has been found that it is necessary to impose a flux limit on the thermal electron transport in diffusion calculations of laser-produced plasmas to explain the observed partition of energy into fast and slow ions and x-rays. The effect of such a limit is to retain the deposited energy in the corona of the target. This containment increases the energy loss to fast ions, reduces the x-ray emission, and reduces the hydrodynamic efficiency. Although calculations for plasmas produced by lasers having wavelengths of 1 μm or shorter agree with experiment when a flux limit which is 1/30 times the classical flux limit is applied to the electron thermal flux, I will show that such a flux limit cannot explain the results obtained for 10 μm lasers. In this case it will be shown necessary to invoke a flux limit on the hot or suprathermal electrons.

57981 **(LA-UR—83-2570) Materials needs for compact fusion reactors.** Krakowski, R.A. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 15p. (CONF-830942—39). NTIS, PC A02/MF A01. Order Number DE84001366.

From 3. topical meeting on fusion reactor materials; Albuquerque, NM, USA (19 Sep 1983).

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The economic prospects for magnetic fusion energy can be dramatically improved if for the same total power output the fusion neutron first-wall (FW) loading and the system power density can

be increased by factors of 3 to 5 and 10 to 30, respectively. A number of compact fusion reactor embodiments have been proposed, all of which would operate with increased FW loadings, would use thin (0.5 to 0.6 m) blankets, and would confine quasi-steady-state plasma with resistive, water-cooled copper or aluminum coils. Increased system power density (5 to 15 MWt/m^3 versus 0.3 to 0.5 MW/m^3), considerably reduced physical size of the fusion power core (FPC), and appreciably reduced economic leverage exerted by the FPC and associated physics result. The unique materials requirements anticipated for these compact reactors are outlined against the well documented backdrop provided by similar needs for the mainline approaches. Surprisingly, no single materials need that is unique to the compact systems is identified; crucial uncertainties for the compact approaches must also be addressed by the mainline approaches, particularly for in-vacuum components (FWs, limiters, divertors, etc.).

57982 **(LA-UR—83-2601) Simulations of the effects of mobile ions on the relativistic beam-plasma instability for intense beams.** Jones, M.E.; Lemons, D.S.; Lee, H. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 5p. (CONF-830911—26). NTIS, PC A02/MF A01. Order Number DE84000369.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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Particle-in-cell simulations of the beam-plasma instability for intense relativistic electron beams in dense plasmas show rapid heating of the electrons to multi-kilovolt temperatures. The resulting hydrodynamic motion of the plasma results in density gradients that degrade the interaction. Heat flow out of the plasma is found in some instances to limit the gradient formation process.

57983 **(LA-UR—83-2602) Microwave generators: oscillating virtual cathodes and reflexing electrons.** Kwan, T.J.T.; Thode, L.E. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 4p. (CONF-830911—27). NTIS, PC A02/MF A01. Order Number DE84001346.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

Simulation of the generation of a relativistic electron beam in a foil diode configuration and of the subsequent intense microwave generation resulting from the formation of the virtual cathode is presented. The oscillating virtual cathode and the trapped beam electrons between the real and the virtual cathodes were found to generate microwaves. Generation of high-power microwaves with about 10% efficiency might be reasonably expected from such a virtual-cathode configuration.

57984 **(LA-UR—83-2840) Laser-plasma interaction at 10.6 microns.** Jones, R.D.; Kindel, J.M. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 36p. (CONF-8305127—2). NTIS, PC A03/MF A01. Order Number DE84001038.

From Spring college on radiation in plasmas; Trieste, Italy (24 May 1983).

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The absorption mechanisms at 10.6μm are considered. Given our best theoretical knowledge, at high intensity, CO_2 absorption is a combination of resonant absorption, critical surface decay processes (rippling), and forward and backward Raman scattering. At low intensities (less than 10^{14}W/cm^2), in short pulse CO_2 experiments, resonant absorption is believed to dominate. The properties of the self generated magnetic fields are considered. These fields greatly affect the hot electron preheat, the lateral transport of energy along the surface of the target, and the enhanced plasma blowoff. And finally, the properties of the enhanced plasma blowoff will be discussed. In directly driven targets, this blowoff represents an energy loss. It has been suggested, however, that the blowoff itself can be used to drive targets.

57985 **(LBL—15616) Summary of the status of negative-ion-based neutral beams.** Cooper, W.S. (Lawrence Berkeley Lab., CA (USA)). Jan 1983. Contract AC03-76SF00098. 13p. (CONF-830406—112). NTIS, PC A02/MF A01. Order Number DE84001328.

From 5. topical meeting on technology of fusion energy; Knoxville, TN, USA (26 Apr 1983).

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Negative-ion-based neutral beam systems can perform multiple functions for fusion reactors, such as heating, current drive in tokamak reactors, and establishing and maintaining potential barriers in tandem mirror reactors. Practical systems operating continuously at the 200 keV, 1 MW level can be built using present-day technology. Ion sources have been demonstrated that produce D^- beams with <5% electron content, and that operate at linear current densities that are within a factor of 2 of what conservatively designed accelerator/transport structures can handle. Concepts are in hand for transporting the negative ion beam through a neutron maze before neutralization, thus permitting a radiation-hardened beamline. With an advanced laser photoneutralizer, overall system power efficiencies of 70% should be possible. A national program is being planned to achieve the goal of application of 475 keV systems on a mirror ETR in 1994.

57986 **(NRL-MR—5170) Analysis of stability and symmetry implications for ICF.** Gardner, J.H.; Bodner, S.E.; Boris, J.P.; Emery, M.H.; Fritts, M.J.; Herbst, M.J. (Naval Research Lab., Washington, DC (USA). Plasma Physics Div.). 12 Oct 1983. Contract AI01-77DP40042. 23p. (CONF-821089—14). NTIS, PC A02/MF A01. Order Number DE84000640.

From 6. international workshop on laser interaction and related plasma phenomena; Monterey, CA, USA (25 Oct 1982).

Pellet gains in excess of 100 will probably be necessary for most applications of inertial fusion. In order to achieve these high gains a number of critical physics elements must be controlled. These include (1) high coupling efficiency, (2) low fuel preheat, (3) implosion symmetry, (4) implosion stability (ablation pressure) and (5) an ignition scheme. These factors interact with each other providing conflicting requirements. The purpose of this paper is to report on the theoretical and computational work that has been carried out in connection with the experimental work at NRL in evaluating the design constraints that are imposed primarily by the symmetry and stability requirements on directly-driven laser fusion targets.

57987 **(SAI—83-1033/PRI-64) Locally omnigenous tandem-mirror design.** D'Ippolito, D.A.; Francis, G.L.; Myra, J.R. (Science Applications, Inc., Boulder, CO (USA). Plasma Research Inst.). Aug 1983. Contract AC03-76ET53057. 13p. NTIS, PC A02/MF A01. Order Number DE84001605.

A simple tandem mirror coil system is found which has the property that the geodesic curvature of the paraxial magnetic field is locally small everywhere. This design approaches the ideal of a locally omnigenous configuration in which the particle drift surfaces coincide with the magnetic flux surfaces. Thus, radial losses due to resonant ion and stochastic radial diffusion are minimized. Plasma distortion due to central cell parallel currents and instability due to trapped particles are also greatly reduced. The advantages and disadvantages of the design for reactor applications are discussed.

57988 **(SAND—83-0610C) Proto-I axial-focusing experiments.** Johnson, D.J.; Leeper, R.J.; Stygar, W.A.; Slutz, S.A. (Sandia National Labs., Albuquerque, NM (USA)). 1983. Contract AC04-76DP00789. 5p. (CONF-830911—21). NTIS, PC A02/MF A01. Order Number DE84000458.

From 5. international conference on high power particle beams; San Francisco, CA, USA (12 Sep 1983).

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The time-integrated axial (z) focus of the 4.5-cm-radius Proto I (1.5 MV, 500 kA) radial proton diode is presently limited to ~ 3 mm FWHM. This result is obtained with current neutralized beam transport in a gas cell with 6 Torr argon. If the vertical local divergence were the same (1° or less) as the horizontal divergence, the local divergence alone would produce a 1.5 mm FWHM focus. The axial focal size is evidently limited by time-dependent effects. These are studied by observing the beam incident upon various targets with two time-resolved pinhole cameras. The first camera observes Rutherford-scattered protons from gold targets with an

array of 11 silicon PIN detectors. The second camera observes K/ sub α/-fluorescence from aluminum targets with 4 independently-gated microchannel plates imaging tubes.

57989 **(UCRL—87670) Improved 50-kV pulser design.** Oicles, J.A.; Fulkerson, E.S. (Lawrence Livermore National Lab., CA (USA)). 27 May 1982. Contract W-7405-ENG-48. 6p. (CONF-8306129—1). NTIS, PC A02/MF A01. Order Number DE84000473.

From 15. IEEE power modulator symposium; Baltimore, MD, USA (14 Jun 1983).

A compact 50 kilovolt pulser has been developed as a gas switch trigger. This unit combines a grounded grid thyratron with a ferrite loaded step-up transformer to provide the required output voltage. A magnetic switch at the output brings the risetime down to the ten nanosecond range. Unit operation is specified into a 25 ohm resistive load. Integral with the pulser package is the necessary low level support electronics to power the thyratron and to provide trigger and diagnostic functions. Package volume is less than .02 m^3.

57990 **(UCRL—88814) Large laser system facility design.** Gilmartin, T.J. (Lawrence Livermore National Lab., CA (USA)). 9 Aug 1983. Contract W-7405-ENG-48. 40p. (CONF-8309155—1). NTIS, PC A03/MF A01. Order Number DE84000159.

From International conference on lasers; Guangzhou, China (6 Sep 1983).

Optical stability of foundations and support structures, environmental control, close-in subsystem integration, spatial organization, materiel flow and access to remote subsystems is discussed and compared for four laser facilities: The Special Isotope Separation Laboratory, Argus, Shiva/Nova, and Firepond.

57991 **(UCRL—88957) Laser-fusion rocket for interplanetary propulsion.** Hyde, R.A. (Lawrence Livermore National Lab., CA (USA)). 27 Sep 1983. Contract W-7405-ENG-48. 14p. (CONF-8310171—1). NTIS, PC A02/MF A01. Order Number DE84001238.

From 34. International Astronautical Federation conference; Budapest, Hungary (10 Oct 1983).

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A rocket powered by fusion microexplosions is well suited for quick interplanetary travel. Fusion pellets are sequentially injected into a magnetic thrust chamber. There, focused energy from a fusion Driver is used to implode and ignite them. Upon exploding, the plasma debris expands into the surrounding magnetic field and is redirected by it, producing thrust. This paper discusses the desired features and operation of the fusion pellet, its Driver, and magnetic thrust chamber. A rocket design is presented which uses slightly tritium-enriched deuterium as the fusion fuel, a high temperature KrF laser as the Driver, and a thrust chamber consisting of a single superconducting current loop protected from the pellet by a radiation shield. This rocket can be operated with a power-to-mass ratio of 110 W gm^{-1}, which permits missions ranging from occasional 9 day VIP service to Mars, to routine 1 year, 1500 ton, Plutonian cargo runs.

57992 **(UCRL—89166) Neutral beams for mirrors.** Fink, J.H. (Lawrence Livermore National Lab., CA (USA)). 31 Aug 1983. Contract W-7405-ENG-48. 25p. (CONF-831011—1). NTIS, PC A02/MF A01. Order Number DE84000915.

From American Vacuum Society symposium; Boston, MA, USA (31 Oct 1983).

An important demonstration of negative ion technology is proposed for FY92 in the MFTF-α+T, an upgrade of the Mirror Fusion Test Facility at the Lawrence Livermore National Laboratory. This facility calls for 200-keV negative ions to form neutral beams that generate sloshing ions in the reactor end plugs. Three different beam lines are considered for this application. Their advantages and disadvantages are discussed.

57993 **Compact tori.** Furth, H.P. (Princeton Univ., NJ (USA). Plasma Physics Lab.). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 93-110(15 Mar 1983). (CONF-820644—). Contract AC02-76CH03073.

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

The design of conventional toroidal fusion reactors is constrained by the need to link the plasma torus (and its surrounding blanket) with a set of toroidal-field-generating coils. Compact-torus research is aimed at the objective of creating stable toroidal plasma entities in the absence of an external toroidal field, so that the conventional constraint on reactor design can be removed. Two basic types of grossly stable compact tori have been demonstrated experimentally and theoretically: (1) A low-aspect-ratio toroid of oblate spheroidal outer contour, with finite internal toroidal field (commonly called 'spheromak') can be formed by a 'magnetized' coaxial plasma gun, or by a reverse-poloidal-field pinch, or by the transformer action of a 'magnetic flux core'. (2) A plasma toroid with a prolate (racetrack-shaped) confining poloidal field and strictly null toroidal field can be formed by dynamic reverse-poloidal-field pinch techniques.

57994 **Compact tori for alternate fuel fusion.** Miley, G.H. (Illinois Univ., Urbana (USA). Fusion Studies Lab.). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 111-120(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

Also published as report CONF-820644--5, 1982.

A D-T burn dynamic experiment using a scaled-up field-reversed theta-pinch device is proposed as a first step towards demonstration of a D-^{3}He burn. The feasibility of such an experiment is based on a loss-cone-like confinement scaling described here plus the concept of using combined pellet and neutral-beam injection to heat the plasma, build-up its density, and damp the m=2 instabiiity. The potential extension to a D-^{3}He reactor is also discussed.

57995 **Toroidal confinement experiment featuring direct ohmic heating of the ions.** Dawson, J.M.; Leboeuf, J.N.; Ratliff, S.T. (California Univ., Los Angeles (USA). Dept. of Physics); Luhmann, N.C. Jr.; Rhodes, M. (California Univ., Los Angeles (USA). Dept. of Electrical Sciences and Engineering). *Nuclear Instruments and Methods in Physics Research;* **207**: No. 1/2, 197-206(15 Mar 1983). (CONF-820644—).

From Conference on new trends in unconventional approaches to magnetic fusion; Stockholm, Sweden (16 Jun 1982).

Recently a toroidal plasma device with the confinement being provided by surface multipole magnetic cusps generated by permanent magnets has been operated at UCLA. The cusps are oriented in the poloidal direction and have a maximum field strength of 1.3 kG. A toroidal current is driven by a transformer; the loop voltage is about 100 V. It is found that for a hydrogen plasma a current of 3 to 6 kA is driven and that the current is carried by the ions. This gives direct ion heating to temperature of 40 to 100 eV in a 10^{13} cm^{-3} density hydrogen plasma. The electron temperature is lower, being in the 20-40 eV range. The β of the plasma is high, in the 20-30% range. We have simulated the operation of this device using a 2 1/2 dimensional electromagnetic particle code. The model duplicates many of the features of the experiment, including the restraint of electron current by the cusps while the ions flow relatively freely, the focussing of the streaming ions to the center of the chamber by the magnetic lens effect of the cusps, and the pinch effect. A simple theoretical treatment explains both the experiments and the simulations, although the detailed simulation results indicate the need for a more complete theory.

57996 **Modular stellarator fusion reactor (MSR) concept.** Miller, R.L.; Krakowski, R.A. (Los Alamos National Lab., NM (USA)). pp 343-357 of Fusion reactor design and technology. Proceedings of the third technical committee meeting and workshop organized by the IAEA and held in Tokyo, Japan, 5-16 October 1981. Vol. 1. Vienna, Austria; IAEA (1983). (CONF-811046—; IAEA-TC—392/20).

From Meeting and workshop on fusion reactor design and technology; Tokyo, Japan (5 Oct 1981).

A preliminary conceptual study has been made of the Modular Stellarator Reactor (MSR) as a steady-state, ignited, DT-fueled, magnetic fusion reactor. The MSR concept combines the physics of classic stellarator confinement with an innovative, modular-coil

design. Parametric tradeoff calculations are described, leading to the selection of an interim design point for a 4.8-GWt plant based on Alcator transport scaling and an average beta value of 0.04 in an l=2 system with a plasma aspect ratio of 11. Neither an economic analysis nor a detailed conceptual engineering design is presented here, as the primary intent of this scoping study is the elucidation of key physics tradeoffs, constraints, and uncertainties for the ultimate power-reactor embodiment.

57997 **Stellarator physics evaluation studies.** Lyon, J.F.; Carreras, B.A.; Harris, J.H. (Oak Ridge National Lab., TN (USA)). pp 115-126 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/Q-3).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Stellarator/torsatron configurations with a wide range of parameters have been evaluated and compared in terms of their vacuum field topology, MHD equilibrium and stability, and guiding centre orbit confinement. The torsatron configurations are found to be the most suitable choice for a near-term physics experiment. The best of these configurations has an equilibrium beta limit of $<\beta>$ approx.= 5% for a plasma aspect ratio of 7. The equilibrium limit can be increased to $<\beta>$ approx.= 8% by doubling the aspect ratio. Modularization of the torsatron coils can be achieved in a practical way that retains all the physics properties of the configuration. The modularization introduces additional flexibility, which allows the realization of a larger variety of vacuum flux surface topologies. The feasibility of modularizing the coils and the reasonable physics parameters found for a configuration with moderate aspect ratio make torsatron configurations very attractive, both for physics experiments and for future fusion reactors.

57998 **Two high-beta toroidal configurations: a stellarator and a tokamak-torsatron hybrid.** Boozer, A.H.; Chu, T.K.; Dewar, R.L. (Princeton Univ., NJ (USA). Plasma Physics Lab.). pp 129-139 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/Q-4).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

Two novel modular-coil toroidal confinement systems are presented, both having simple coil structures, quasi-helical symmetry, and a potential for stable high-beta confinement. The tokatron is a highly elongated tokamak with finite vacuum-field rotational transform provided by twisting the toroidal field coils so as to lie in surfaces with vertically oriented screw symmetry. The heliac consists of an l=1 helical field superimposed on the poloidal field produced by a current-carrying toroidal conductor. It has a magnetic well even in the limit of large-aspect-ratio R/a.

57999 **Stability and symmetry in inertial confinement fusion.** Emery, M.H.; Bodner, S.E.; Boris, J.P.; Colombant, D.G.; Cooper, A.L.; Fritts, M.J.; Gardner, J.H.; Manheimer, W.M. (Naval Research Lab., Washington, DC (USA)). pp 357-366 of Plasma physics and controlled nuclear fusion research 1982. Proceedings of the ninth international conference on plasma physics and controlled nuclear fusion research held by the IAEA in Baltimore, 1-8 September 1982. Vol. 3. Vienna, Austria; IAEA (1983). (CONF-820930—; IAEA-CN—41/W-9).

From 9. international conference on plasma physics and controlled nuclear fusion research (IAEA); Baltimore, MD, USA (1 Sep 1982).

The asymmetries of spherical implosions driven by direct laser illumination are of fundamental concern to the inertial confinement fusion community because they provide severe limitations on high gain pellet designs. Theoretical progress on several fronts has recently been made through numerical simulations in providing a more complete understanding of the physical processes involved in these asymmetries and instabilities. The results also suggest methods of controlling these processes and their implications for laser fusion systems design. Stability and symmetry issues have been investigated using an adaptively gridded two-dimensional fully nonlinear Eulerian computer model (FAST2D) and a triangular grid Lagrangian computer model (SPLISH). Laser matter coupling and scaling laws relating the asymmetry results to spherical pellet designs have been investigated using a one-dimensional sliding zone adaptive gridding fluid code (FAST1D). Principal results include finding: (1) the requirements for thermal smoothing of laser non-uniformities; (2) reduced Rayleigh-Taylor growth rates and saturation via the non-linear Kelvin-Helmholtz roll-up; (3) that perturbation wavelengths greater than the shell thickness are most likely to cause an asymmetric implosion; (4) a new theory based on vortex sheddi:g that explains the reduced linear Rayleigh-Taylor growth rates; and (5) a possible wavelength intensity window for direct illumination where the requirements of pellet velocity, symmetry and efficiency necessary for high gain can be simultaneously met.

99 GENERAL AND MISCELLANEOUS

58000 **(CONF-831235—1) Interactions of incentive and information structures.** Ho, Y.C.; Teneketzis, D. (Harvard Univ., Cambridge, MA (USA); ALPHATECH, Inc., Burlington, MA (USA)). 1983. Contract AC01-80RA50418. 14p. NTIS, PC A02/MF A01. Order Number DE83012084.

From 22. IEEE conference on decision control; San Antonio, TX, USA (14 Dec 1983).

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The subject of incentive control theory (i.e., control theory where the control is exerted indirectly) is still in its infancy. Similar to decentralized stochastic optimal control, it has intimate connection to the information structure of the problem. Incredible complexity exists even in the simplest problems. However, unlike the case of decentralized control where fundamental computational difficulties exist, incentive control offers the possibility of solving genuine problems with non-nested information structure. New conceptual, theoretical, and computational issues are awaiting further development.

58001 **(INIS-mf—8575) 13. general meeting IMA 82, 19-25 Sep 1982, Varna, Bulgaria. Abstracts of papers.** (International Mineralogical Association (IMA)). Sep 1982. 451p. (CONF-820956—Absts.). NTIS (US Sales Only), PC A20/MF A01. Order Number DE83781087.

From 13. general meeting of the International Mineralogical Association; Varna, Bulgaria (19 Sep 1982).

Individual items in scope for the data base were processed separately.

58002 **(ORNL/TM—8903) Chemical characterization and toxicologic evaluation of airborne mixtures: generating, monitoring, and controlling petroleum aerosols for inhalation-chamber studies. Task summary report.** Holmberg, R.W.; Moneyhun, J.H.; Gayle, T.M. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 42p. NTIS, PC A03/MF A01. Order Number DE84001447.

A system has been designed and built for generating, monitoring and controlling concentrated petroleum aerosols for an inhalation toxicology study of a diesel fuel aerosol such as is produced in the military vehicle engine exhaust smoke system (VEESS). The generator, an on-line light scattering particle monitor, and a spent aerosol clean up system are discussed. An addition to the exposed chambers to laminarize the flow to insure a homogeneous exposure atmosphere is also discussed. The design parameters are based on experience gained in the laboratory and in the course of a large scale inhalation toxicology experiment for the past two years. Aerosol concentrations from 0.25 to 20 mg/L (routinely to 6 mg/L) have been developed for periods up to six hours. The generators, the monitoring system, and the spent aerosol removal system have also been found effective for less volatile petroleum based obscurants such as Fog Oil. This report emphasizes the hardware and electronic control system; the characterization of the aerosol with

respect to both its physical and chemical properties and a discussion of the toxicology have been presented elsewhere.

9901 Management

REFER ALSO TO CITATION(S) 57886

58003 **(DOE/ET/26940—T2) Prioritization analysis.** Johnson, C.R. (Maryland Univ., College Park (USA)). 24 Jan 1979. Contract AS05-77ET26940. 42p. NTIS, PC A03/MF A01. Order Number DE83018192.

This paper is a survey of the mathematical techniques for R and D project selection. While the majority of the sophisticated models used linear, integer or dynamic programming, the specification of objectives and constraints vary from model to model.

58004 **(EGG-M—11483) Creation, control, retention, and destruction - managing the records cycle.** Ledbetter, K.L. (EG and G Idaho, Inc., Idaho Falls (USA)). 1983. Contract AC07-76ID01570. 4p. (CONF-830991—1). NTIS, PC A02/MF A01. Order Number DE84000661.

From 7. national Nuclear Records Management Association symposium; Atlanta, GA, USA (12 Sep 1983).

The records cycle is defined, the types of documents created in a typical nuclear plant environment are specified and the records management objectives attendant to each phase of the cycle are discussed.

58006 **(LA-UR—83-1893) Using INGRES as a rapid prototyping device during development of management information applications.** Brice, L.; Connell, J.; Shafer, D. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 24p. (CONF-831152—1). NTIS, PC A02/MF A01. Order Number DE83014146.

From Symposium on application and assessment of automated tools for software development; San Francisco, CA, USA (1 Nov 1983).

This paper presents case studies from the Administrative Data Processing Division of the Los Alamos National Laboratory where a prototyping too, the INGRES relational database system, has been used to develop management information systems. The tool has proved valuable in satisfying user requirements and expectations, and in aiding data processing in the analysis and specification phases of the system life cycle. The prototype approach helps enormously in bridging the developer-user communication gap and has been found to add a negligible amount of cost to the entire software development project. Presented here are four case studies of how INGRES has been employed in prototyping. Also presented are examples of specific INGRES features and how they were used in one of the case studies and further examples involving another similar case. Special considerations and cautions are required when using INGRES for prototyping, but the overall conclusion is that it is a tool which has tremendously benefited our organization. Whether the final implemented system is INGRES-based or not, prototyping greatly enhances the possibility of complete, correct and unambiguous specifications prior to final software product development.

58008 **(SAND—83-8243) Purchase Order Graphical Output (POGO).** Schafer, C.T.; Zimmerman, P.W. (Sandia National Labs., Livermore, CA (USA)). Oct 1983. Contract AC04-76DP00789. 61p. NTIS, PC A04/MF A01. Order Number DE84001062.

The Purchase Order Graphical Output (POGO) system was created to provide up-to-date financial reporting and accounting of Direct Charge (DC) purchases, including emergency orders and excluding shop and plant expenditures, and to provide improved summaries in the form of bar charts, monthly plots, and tabular listings. The budget and committed amounts can be kept up to date by entering purchase requisitions and budget changes on a daily basis. The money actually costed will be out of date by the amount of time required by SNLA financial accounting to make payouts, enter them into the computer, then transfer the data to SNLL. The graphics are done through the TELL-A-GRAF facility. Thus, the user has the flexibility to alter the format or text of a plot to suit individual needs. Furthermore, report quality reproductions are easily obtained.

9902 Mathematics And Computers

REFER ALSO TO CITATION(S) 56858, 56938, 57738, 58003, 58005, 58006

58007 **(CONF-8310161—1) Tools for the creation of IMS database designs from Entity-Relationship diagrams.** Margrave, G.; Lusk, E.L.; Overbeek, R.A. (Northern Illinois Univ., Dekalb (USA); Argonne National Lab., IL (USA)). 1983. Contract W-31-109-ENG-38. 16p. NTIS, PC A02/MF A01. Order Number DE84000592.

From 3. international conference on entity-relationship approach; Anaheim, CA, USA (5 Oct 1983).

This paper presents an overview of a system of software tools that can be used in preparing database designs. The design technique is based on the Entity-Relationship model - the tools allow a designer to conveniently develop an Entity-Relationship model, from which an Extended Entity-Relationship model is produced. The extended Entity-Relationship model is used as input to tools that generate the basic design appropriate to the target database management system. This paper reports on only the tools to generate an IMS design from the extended Entity-Relationship model.

58008 **(KFK-PFT—51) Advanced programming languages for industrial robots.** Wolter, H. (Kernforschungszentrum Karlsruhe G.m.b.H. (Germany, F.R.). Projekttraegerschaft Fertigungstechnik). Feb 1983. 210p. (In German). NTIS (US Sales Only), PC A10/MF A01. Order Number DE83751265.

With 51 figs.

With this report, the sponsor of the project on automation in manufacture introduces to the public several new programming procedures for industrial robots which are still under construction. In addition to the programming systems SRL - which, as already previously reported, represent an further development of the AL and ROBEX systems - two additional programming procedures are being described. These are adjusted to perform interactive work at the production site. As introduction to this report, a survey is offered on the status and development of robot programming in the Federal Republic of Germany and in other countries.

58009 **(LA-UR—83-2862) Remarks on the Kuramoto-Sivashinsky equation.** Nicolaenko, B.; Scheurer, B. (Los Alamos National Lab., NM (USA)). 1983. Contract W-7405-ENG-36. 9p. (CONF-8305110—3). NTIS, PC A02/MF A01. Order Number DE84001018.

From Fronts, interfaces and patterns conference; Los Alamos, NM, USA (2 May 1983).

We report here a joint work in progress on the Kuramoto-Sivashinsky equation. The question we address is the analytical study of a fourth order nonlinear evolution equation. This equation has been obtained by Sivashinsky in the context of combustion and independently by Kuramoto in the context of reaction diffusion-systems. Both were motivated by (nonlinear) stability of travelling waves. Numerical calculations have been done on this equation. All the results seem to indicate a chaotic behavior of the solution. Therefore, the analytical study is of interest in analogy with the Burger's and Navier-Stokes equations. Here we give some existence and uniqueness results for the equation in space dimension one, and we also study a fractional step method of numerical resolution. In a forthcoming joint paper with R. Temam, we will study the asymptotic behavior, as t approaches infinity, of the solution of (0.1) and give an estimate on the number of determining modes.

58010 **(ORNL—5967) Analysis/plot generation code with significance levels computed using Kolmogorov-Smirnov statistics valid for both large and small samples.** Kurtz, S.E.; Fields, D.E. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 66p. NTIS, PC A04/MF A01. Order Number DE84001581.

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This report describes a version of the TERPED/P computer code that is very useful for small data sets. A new algorithm for determining the Kolmogorov-Smirnov (KS) statistics is used to extend program applicability. The TERPED/P code facilitates the analysis of experimental data and assists the user in determining its probability distribution function. Graphical and numerical tests are performed interactively in accordance with the user's assumption of normally or log-normally distributed data. Statistical analysis options include computation of the chi-square statistic and the KS one-sample test statistic and the corresponding significance levels. Cumulative probability plots of the user's data are generated either via a local graphics terminal, a local line printer or character-oriented terminal, or a remote high-resolution graphics device such as the FR80 film plotter or the Calcomp paper plotter. Several useful computer methodologies suffer from limitations of their implementations of the KS nonparametric test. This test is one of the more powerful analysis tools for examining the validity of an assumption about the probability distribution of a set of data. KS algorithms are found in other analysis codes, including the Statistical Analysis Subroutine (SAS) package and earlier versions of TERPED. The inability of these algorithms to generate significance levels for sample sizes less than 50 has limited their usefulness. The release of the TERPED code described herein contains algorithms to allow computation of the KS statistic and significance level for data sets of, if the user wishes, as few as three points. Values computed for the KS statistic are within 3% of the correct value for all data set sizes.

58011 **(SAND—83-1226) Smoother interpolant for DE/STEP,INTRP and DEABM.** Shampine, L.F.; Watts, H.A. (Sandia National Labs., Albuquerque, NM (USA)). Aug 1983. Contract AC04-76DP00789. 37p. NTIS, PC A03/MF A01. Order Number DE84001080.

This report discusses a way of obtaining a smoother (globally C^1) interpolant for the Adams family of ODE methods. Details are provided for implementing the algorithm in the DE/STEP,INTRP suite of codes and its descendant DEABM.

58012 **(SOL—83-14) Subdivisions and antiprisms for PL homotopy algorithms.** Broadie, M.N. (Stanford Univ., CA (USA). Systems Optimization Lab.). Aug 1983. Contract AT03-76ER72018. 130p. NTIS, PC A07/MF A01. Order Number DE84001615.

The study of homotopies for solving equations is an important and rapidly growing field which has applications to economics, game theory, and differential equations. Much progress has been made in recent years on improving the efficiency of homotopy methods. One critical factor in the efficiency of the piecewise linear (PL) homotopy method is the subdivision used. Several new subdivisions have been proposed, but there has been relatively little comparison of these subdivisions. This disseration focuses on the construction, implementation, analysis, and comparison of subdivisions for PL homotopy algorithms.

58013 **(UCID—19896) LTSS shell for NLTSS. Version 1.0.** Fisher, D.S. (Lawrence Livermore National Lab., CA (USA)). 7 Sep 1983. Contract W-7405-ENG-48. 68p. NTIS, PC A04/MF A01. Order Number DE84001219.

The LTSS Shell (LTSS/CLI) provides a calling sequence compatible environment for execution of LTSS loaded programs. Any LTSS program that makes ordinary system requests through BASELIB can be reloaded with the Shell compatible library NBASELIB, to make equivalent requests to the LTSS Shell. The Shell provides a terminal view of NLTSS that very closely resembles LTSS, and maps the structure of the LTSS filing system onto the NLTSS directory system.

58014 **(UCRL—89129) Performance of CAMAC I/O with an HP A600.** Telford, S.J. (Lawrence Livermore National Lab., CA (USA)). 31 Aug 1983. Contract W-7405-ENG-48. 18p. (CONF-8310168—2). NTIS, PC A02/MF A01. Order Number DE84001232.

From HP 1000 international users group conference; Fort Worth, TX, USA (18 Oct 1983).

The ability to transfer large quantities of data in a short period of time between computers and front-end instrumentation is very important in experiments where transient data acquisition is performed. The Mars project at Lawrence Livermore National Laboratory is such an experiment. We need to transfer 64 Kbytes of data from a multichannel data logger to an HP A600 computer. In order to maintain the overall performance guidelines of the data acquisition system, we need to transfer the 64 Kbytes of data in one second or less. To meet the data transfer requirement each component in the communication path must be least meet, and preferably exceed, the required data transfer rate. These components include an HP A600 CPU operating under RTE-A.1, an HP 12009A HPIB interface card, the GPIB instrumentation bus, a GPIB-CAMAC crate controller, and a LeCroy 8212A-32 data logger. In configuring the system to meet the above requirement, we found it necessary to analyze the performance of each component in the communication path.

58015 **(UCRL—89740) Vectorizing and machine-spanning techniques.** Giroux, E.D. (Lawrence Livermore National Lab., CA (USA)). 22 Sep 1983. Contract W-7405-ENG-48. 10p. (CONF-8309154—1). NTIS, PC A02/MF A01. Order Number DE84000469.

From Parallel computing '83; Berlin, F.R. Germany (26 Sep 1983).

Techniques for vectorizing complex logic are shown using a decoupled sliding-surface calculation that is part of a two-dimensional Lagrangian simulation model. The same source coding can be run on many vector, parallel, and multiprocessor computers with very little or no alteration. The vectorizing techniques have been used for a wide range of problems.

58016 **(UCRL—89893) Adding statistics routines to the SLATEC public-domain subprogram library.** Durst, M.J.; Margolies, D.S.; Fong, K. (Lawrence Livermore National Lab., CA (USA)). Aug 1983. Contract W-7405-ENG-48. 7p. (CONF-830899—4). NTIS, PC A02/MF A01. Order Number DE84001234.

From Annual meeting of American Statistical Association and other statistical groups; Toronto, Canada (15 Aug 1983).

The SLATEC library is a public-domain portable library of FORTRAN subroutines organized by several DOE and DOD laboratories. SLATEC includes a comprehensive set of mathematical routines, including special functions, linear algebra, and differential equation solvers. These routines will run on most computers which support FORTRAN. This year the decision was made to include statistical routines in SLATEC, and some routines are currently being added. This paper will discuss the nature of SLATEC, indicate plans for the statistics routines, and call for further contributions to SLATEC.

9903 Information Handling

58017 **(ORNL/CSD/TM—207) User's guide for an IBM PL/I implementation of the International Standard Organization DIS 8211 information processing: specification for a data-descriptive file for information interchange.** Brooks, A.A.; Hammerling, F.D.; McNeely, B.N. (Oak Ridge National Lab., TN (USA)). Oct 1983. Contract W-7405-ENG-26. 59p. NTIS, PC E04/MF A01. Order Number DE84000336.

Includes 2 sheets of 48x reduction microfiche.

This document describes an IBM PL/I implementation of the International Standard Organization DIS 8211 Information Processing - Specification for a Data Descriptive File for Information Interchange. This implementation is in the form of user callable, multiple entry PL/I subprograms that perform the functions necessary for the creation of and retrieval from these files. This document also describes two typical main procedures which make use of the general purpose subroutines. The first is a main procedure which creates the Data Descriptive File and which calls input routines to obtain the required input data. Two of these input routines are described. The second main procedure provides for the retrieval of records and fields from an existing Data Descriptive file and produces output lists of the data and field controls.

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DOE Energy Information Data Base: Corporate Author Entries (DOE/TIC-4585) is used in the standardization of corporate entries. DOE/TIC-4585 is available for purchase from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, Virginia 22161.

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The notations in the final parentheses indicate the type of document, e.g., R for Report; the country of publication, e.g., US; and the language if other than English, e.g., In German. Tables of document types and country of publication codes appear after the indexes.

The title may be supplemented with additional words, or a phrase, if it appears additional information would be helpful. In cases for which the title contains little or no information related to the subject entry, it may be replaced entirely by the supplementary information. A qualifier is not always required, and in such cases the title will follow the unqualified subject descriptor.

The descriptors selected for use as subject terms are generally the names of specific materials, things, or processes. To the extent possible, a qualifier is selected to describe the properties of, or processes applied to, the subject term.

Index entries are selected to indicate the important ideas and concepts presented in a document, rather than words that may appear in the text. Within the available thesaurus terms, the most probable or logical place to look for typical information is selected. "See references" are included to guide users from synonymous terms or phrases to the descriptor selected as a subject heading for the concept. (e.g. Pipeline Quality Gas see HIGH BTU GAS). "See also references" are used to indicate where to find references to subject concepts that are narrower, broader, or related to a particular subject heading. To complete an exhaustive search of a given subject, all such headings should be reviewed. Copies of DOE/TIC-7000, the Subject Thesaurus, are available from the National Technical Information Service (NTIS), U. S. Department of Commerce, Springfield, VA 22161.

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	Terra Tek, Inc., Salt Lake City, UT (USA)	
	8:56973	SAND—82-7221
	Sandia National Labs., Albuquerque, NM (USA)	
	8:56987	SAND—83-1153
	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:57062	DOE/JPL—1060-60-Vol.1
	8:57063	DOE/JPL—1060-60-Vol.2
	Sandia National Labs., Albuquerque, NM (USA)	
	8:57182	NUREG/CR—1278
	8:57185	NUREG/CR—3330
	8:57186	NUREG/CR—3401-R7
	8:57187	NUREG/CR—3421
	Exxon Research and Engineering Co., Linden, NJ (USA). Advanced Energy Systems Labs.	
	8:57214	SAND—83-7108
	Sandia National Labs., Albuquerque, NM (USA)	
	8:57389	SAND—82-2903C
	8:57498	SAND—83-1120C
	8:57505	SAND—82-2018C
	8:57506	Society of Petroleum Engineers of A.I.M.E. (American Institute of Mining, Metallurgical an
	8:57516	SAND—83-0971
	8:57534	SAND—83-0223C
	8:57539	SAND—83-1963C
	8:57555	SAND—83-0590C
	8:57556	SAND—83-0607C
	8:57557	SAND—83-0608C
	8:57584	SAND—83-2109C
	8:57739	SAND—83-2102C
	8:57756	SAND—82-2343
	8:57757	SAND—83-1898
	8:57799	SAND—83-0629C
	8:57800	SAND—83-1918C
	8:57801	SAND—83-2094C
	8:57988	SAND—83-0610C
	Sandia National Labs., Livermore, CA (USA)	
	8:58006	SAND—83-8243
	Sandia National Labs., Albuquerque, NM (USA)	
	8:58011	SAND—83-1226
AC04-76EV01013	**Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (USA). Inhalation Toxicology Research Inst.**	
	8:56890	LMF—103
AC05-76OR00033	**Oak Ridge Associated Universities, Inc., TN (USA)**	
	8:57189	ORAU/IEA—83-2(M)-Rev.
AC05-79ET21001	**Ebasco Services, Inc., New York (USA)**	
	8:57066	DOE/ET/21001—T2
AC05-79ET29180	**Simplex Wire and Cable Co., Portsmouth, NH (USA)**	
	8:57068	DOE/ET/29180—T1
AC05-81OR20837	**Science Applications, Inc., Wayne, PA (USA)**	
	8:56858	DOE/EIA—0432
	8:56859	DOE/EIA—0433
AC06-76RL01830	**Pacific Northwest Lab., Richland, WA (USA)**	
	8:56970	PNL-SA—11648

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	8:56978	DOE/UMT—0215
	Battelle Columbus Labs., OH (USA)	
	8:56985	ONWI—505
	Pacific Northwest Lab., Richland, WA (USA)	
	8:56986	PNL-SA—11475
	8:57145	PNL-SA—10932
	8:57166	PNL-TR—433(Oct 1983).
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	8:57205	NYSERDA—82-20
	Pacific Northwest Lab., Richland, WA (USA)	
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	8:57358	PNL—4727
	8:57385	PNL-SA—11544
	8:57423	Journal of Non-Crystalline Solids 49 NO. 1-3. 397-412 (May 1982).
	8:57572	PNL-SA—11213
	8:57613	Ecology 64 NO. 4. 752-760 (1983).
	8:57631	PNL-SA—11141
	8:57718	Comparative Biochemistry and Physiology [Part] B: Comparative Biochemistry 71B NO. 3. 455-
AC06-76RL01857	**UNC Nuclear Industries, Inc., Richland, WA (USA). Office of Surplus Facilities Management**	
	8:56971	RLO/SFM—82-7
AC06-80ER53098	**Mathematical Sciences Northwest, Inc., Bellevue, WA (USA)**	
	8:57971	DOE/ER/53098—2
AC07-76ID01570	**EG and G Idaho, Inc., Idaho Falls (USA)**	
	8:56829	EGG-M—00483
	8:56954	DOE/LLW—6Tg
	Gold Kist, Inc., Decatur, AL (USA). Decatur Soy Div.	
	8:57008	DOE/RA—50297
	EG and G Idaho, Inc., Idaho Falls (USA)	
	8:57105	EGG-M—00183
	8:57136	EGG-TMI—6272
	8:57172	EGG-M—17682
	8:57188	NUREG/CR—3462
	8:57303	EGG-M—18083
	8:57972	EGG-M—09283
	8:58004	EGG-M—11483
AC08-81NV10162	**Nevada Univ., Reno (USA). Water Resources Center**	
	8:57593	DOE/NV/10162—11
AC08-82DP40152	**KMS Fusion, Inc., Ann Arbor, MI (USA)**	
	8:57968	DOE/DP/40152—T2
	8:57969	DOE/DP/40152—T3
AC08-83NV10282	**EG and G, Inc., Goleta, CA (USA). Energy Measurements Group**	
	8:56980	EGG—1183-2419
	8:56981	EGG—1183-2460
	8:56982	EGG—10282-2004
	EG and G, Inc., Las Vegas, NV (USA). Energy Measurements Group	
	8:57617	EGG—10282-1004
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Lab.**	
	8:56956	DP—83-125-1
	Du Pont de Nemours (E.I.) and Co., Aiken, SC (USA). Savannah River Plant	
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	8:56958	DP-MS—83-88
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	8:57169	DPST—82-1085
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	8:57510	DP-MS—83-5
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	8:57595	DP-MS—83-92
	8:57635	DPST—82-1076
	8:57636	DPST—83-671
	8:57637	DPST—83-673
	8:57638	DPST—83-693
	8:57689	DPST—83-319
AC09-76SR00819	**Savannah River Ecology Lab., Aiken, SC (USA)**	
	8:56988	SREL—13
	8:57611	Ecology 64 NO. 4. 642-647 (1983).
AC11-76PN00014	**Bettis Atomic Power Lab., West Mifflin, PA (USA)**	
	8:57140	WAPD-MRP—160
AC13-76GJ01664	**Bendix Field Engineering Corp., Grand Junction, CO (USA)**	
	8:56927	GJBX—36(83)
AC19-79BC10069	**Illinois Inst. of Tech., Chicago (USA)**	
	8:56897	DOE/BC/10069—22
AC19-79BC10079	**University of Tulsa, Tulsa, Oklahoma**	
	8:56899	American Society of Mechanical Engineers, [Paper] 83-PET-30 14 (1983).
AC19-80BC10114	**Acurex Corp., Mountain View, CA (USA)**	
	8:57289	DOE/BC/10114—12
AC21-78ET12307	**Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.**	
	8:57523	DOE/ET/12307—1433
	8:57524	DOE/ET/12307—1434
	Stone and Webster Engineering Corp., New York (USA)	
	8:57525	DOE/ET/12307—1450
	Curtiss-Wright Corp., Wood-Ridge, NJ (USA). Power Systems Div.	
	8:57526	DOE/ET/12307—1469
AC21-79ET15457	**General Electric Co., Schenectady, NY (USA). Advanced Energy Programs Dept.**	
	8:56871	DOE/ET/15457—1428
AC21-81FE05122	**Advanced Fuel Research, Inc., East Hartford, CT**	
	8:56839	Symposium (International) on Combustion, [Proceedings] 1139-1149 (1982).
AC21-81FE15067	**Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.**	
	8:56817	DOE/FE/15067—5-Vol.1
	8:56818	DOE/FE/15067—5-Vol.2
AC21-81MC16221	**United Technologies Research Center, East Hartford, CT**	
	8:56840	Symposium (International) on Combustion, [Proceedings] 1159-1167 (1982).
AC21-81MC16333	**Ohio State Univ., Columbus (USA). Dept. of Engineering Mechanics**	
	8:56916	DOE/MC/16333—1448
AC21-81MC16537	**Georgia Inst. of Tech., Atlanta (USA). School of Chemistry**	
	8:56819	DOE/MC/16537—T6
AC21-82MC19122	**Westinghouse Electric Corp., Madison, PA (USA). Synthetic Fuels Div.**	
	8:56820	DOE/MC/19122—10
	8:56821	DOE/MC/19122—13
	8:56822	DOE/MC/19122—14
	8:56823	DOE/MC/19122—15
	8:56824	DOE/MC/19122—18
	8:56825	DOE/MC/19122—20
	8:56826	DOE/MC/19122—21
AC22-77ET10131	**UOP, Inc., Des Plaines, IL (USA)**	
	8:56813	DOE/ET/10131—T10
AC22-77ET10679	**Engineering Societies Commission on Energy, Inc., Washington, DC (USA)**	
	8:56814	DOE/ET/10679—T19

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AC22-79ET14880	Delaware Univ., Newark (USA). Dept. of Chemical Engineering	
	8:56816	DOE/ET/14880—T5
AC22-80PC39991	Enviro Control, Inc., Rockville, MD (USA)	
	8:56828	DOE/PC/39991—T1
AC22-81PC40272	Solar Turbines, Inc., San Diego, CA (USA)	
	8:57527	DOE/PC/40272—T4
AC22-82PC50254	Advanced Fuel Research, Inc., East Hartford, CT (USA)	
	8:56872	DOE/PC/50254—T5
AI01-76ET12548	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:56860	DOE/ET/12548—17
AI01-76ET20356	Jet Propulsion Lab., Pasadena, CA (USA)	
	8:57041	DOE/JPL—1012-79A
AI01-77DP40042	Naval Research Lab., Washington, DC (USA). Plasma Physics Div.	
	8:57986	NRL-MR—5170
AI21-77ET13111	National Aeronautics and Space Administration, Cleveland, OH (USA). Lewis Research Center	
	8:56827	DOE/NASA/13111—15
AI21-80ET17088	Aerospace Corp., El Segundo, CA (USA)	
	8:57253	DOE/NASA—2701-3
AM21-78MC08216	Science Applications, Inc., Morgantown, WV (USA)	
	8:56909	DOE/MC/08216—1440-Vol.1
	8:56913	DOE/MC/08216—1440-Vol.2
AS01-77ET29035	Texas A and M Univ., College Station (USA). Research Foundation	
	8:57123	DOE/ET/29035—T1
AS03-77ET29138	Santa Clara Univ., CA (USA)	
	8:57124	DOE/ET/29138—1
AS05-76ER03992	Texas Univ., Austin (USA)	
	8:57882	DOE/ER/03992—512
AS05-76ER04837	Oklahoma State Univ., Stillwater (USA). Dept. of Physics	
	8:57370	DOE/ER/04837—8
AS05-76EV03408	Texas Univ., Austin (USA). Lab. of Radiation Biology	
	8:57687	DOE/EV/03408—27
AS05-76EV04946	Tennessee Univ., Knoxville (USA). Energy, Environment and Resources Center	
	8:56861	DOE/EV/04946—6
	Tennessee Univ., Knoxville (USA)	
	8:56862	DOE/EV/04946—6-App.1
	8:56863	DOE/EV/04946—6-App.2
AS05-77ET26940	Maryland Univ., College Park (USA)	
	8:58003	DOE/ET/26940—T2
AS05-78ET10747	California Univ., Santa Barbara (USA). Dept. of Chemical and Nuclear Engineering	
	8:57301	DOE/ET/10747—T1
AS05-80ER10578	Texas A and M Univ., College Station (USA). Dept. of Physics	
	8:57792	DOE/ER/10578—T3
AS05-80ER10742	North Carolina State Univ., Raleigh (USA	
	8:57586	Nuclear Instruments and Methods in Physics Research 208 NO. 1-3. 631-635 (15 Apr 1983).
AS05-80EV10363	Tennessee Univ., Knoxville (USA). Dept. of Chemistry	
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AS07-77ET28365	Colorado Geological Society, Denver	
	8:57102	Field Conference Guidebook (New Mexico Geological Society) 32 333-335 (1981).
AS08-81DP40139	Cornell Univ., Ithaca, NY (USA). Lab. of Plasma Studies	
	8:57967	DOE/DP/40139—2
AS08-82DP40173	Illinois Univ., Urbana (USA)	
	8:57507	DOE/DP/40173—1
AS09-76EV00641	Georgia Univ., Athens (USA). Dept. of Entomology	
	8:57608	DOE/EV/00641—51
AS19-80BC10321	University of Southern Mississippi, Hattiesburg (USA). Dept. of Polymer Science	
	8:56898	DOE/BC/10321—12
AS20-81LC10639	Virginia Polytechnic Inst. and State Univ., Blacksburg (USA). Dept. of Civil Engineering	
	8:56920	DOE/LC/10639—T1
AT03-76ER71013	Aerospace Corp., Los Angeles, CA (USA). Chemistry and Physics Lab.	
	8:57428	DOE/ER/71013—T3
	8:57429	DOE/ER/71013—T5
	8:57430	DOE/ER/71013—T6
AT03-76ER72018	Stanford Univ., CA (USA). Systems Optimization Lab.	
	8:58012	SOL—83-14
AT03-76ET30351	Aerospace Corp., El Segundo, CA (USA). Energy and Resources Div.	
	8:57121	ATR—81-(7891-03)-1
AT03-76ET35300	GA Technologies, Inc., San Diego, CA (USA)	
	8:57141	GA-A—17183
AT03-82SF11687	Rockwell International Corp., Canoga Park, CA (USA). Energy Systems Group	
	8:57171	ESG-DOE—13408
AT06-76ER71015	Washington State Univ., Pullman (USA). Dept. of Chemistry	
	8:57447	DOE/ER/71015—3
AT06-76EV70024	Washington Univ., Seattle (USA). School of Oceanography	
	8:57627	DOE/EV/70024—59
AT06-79EV10047	Washington Univ., Seattle (USA). School of Oceanography	
	8:57626	DOE/EV/10047—7
AT06-79EV10270	Univ. of Washington, Seattle	
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	8:57713	DOE/EV/10270—4
AT06-80ET37873	Washington Univ., Seattle (USA)	
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AT06-81ER10879	Washington Univ., Seattle (USA). Dept. of Genetics	
	8:57023	DOE/ER/10879—3
AT06-81EV10611	Oregon State Univ., Corvallis	
	8:57763	Deep-Sea Research, Part A: Oceanographic Research Papers 29 NO. 5. 563-580 (1982).
AT21-82MC19233	West Virginia Univ., Morgantown (USA). Dept. of Chemical Engineering	
	8:57448	DOE/MC/19233—1472
FC02-80CS30583	Southwall Corp., Palo Alto, CA (USA)	
	8:57096	DOE/CS/30583—T1
FC03-78CS32126	San Luis Board of Trustees, CO (USA)	
	8:57070	DOE/CS/32126—T1
FG01-80ET21099	Puerto Rico Electric Power Authority, San Juan	
	8:57067	DOE/ET/21099—T1
FG01-82CE15130	Underground Systems, Arcadia, CA (USA)	
	8:56857	DOE/CE/15130—T2
FG01-82EI11548	Illinois Dept. of Energy and Natural Resources, Springfield (USA)	
	8:56901	DOE/EI/11548—T1
FG01-82EI19619	Portland State Univ., OR (USA)	
	8:56902	DOE/EI/19619—T1
FG02-81R510322	Cleveland Public Schools, OH (USA). Dept. of Research and Analysis	
	8:57286	DOE/R5/10322—3
FG02-83ER75094	California Univ., Santa Barbara (USA)	
	8:57154	DOE/ER/75094—1
FG07-82ID12371	Colorado Office of the Governor, Denver (USA)	
	8:56953	DOE/ID/12371—5

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FG18-79ET14690	Maine Dept. of Conservation, Augusta (USA). Maine Geological Survey	
	8:56855	DOE/ET/14690—T1
FG19-80BC13407	Univ. of Michigan, Ann Arbor	
	8:57758	Symposium (International) on Combustion, [Proceedings] 591-597 (1982).
FG21-80MC14256	Colorado Geological Survey, Denver	
	8:56912	Field Conference Guidebook (New Mexico Geological Society) 32 241-248 (1981).
FG22-81PC40807	Southern Illinois Univ., Carbondale (USA). Coll. of Engineering and Technology	
	8:56870	DOE/PC/40807—T8
FG22-82PC50259		
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FG44-80R410080	North Greenville Coll., Tigerville, SC (USA)	
	8:57071	DOE/R4/10080—T1
FG44-80R410081	Florence-Darlington Technical Coll., Florence, SC (USA)	
	8:57042	DOE/R4/10081—T1
FG44-80R410083	Ward (W. Terry), Lebanon, KY (USA)	
	8:57072	DOE/R4/10083—T1
FG44-80R410084	Mountain Community Workshop, Berea, KY (USA)	
	8:57284	DOE/R4/10084—T1
FG44-80R410085	International Tree Crops Inst. U.S.A., Inc., Gravel Switch, KY. Appalachian Regional Office	
	8:57276	DOE/R4/10085—T1
FG44-80R410086	Mountain Community Workshop, Berea, KY (USA)	
	8:57073	DOE/R4/10086—T1
FG44-80R410088	Production Management Co., Lexington, KY (USA)	
	8:56914	DOE/R4/10088—T1
FG44-80R410089	Environmental Alternatives, Inc., Louisville, KY (USA)	
	8:57256	DOE/R4/10089—T1
FG44-80R410090	Alabama A and M Univ., Huntsville (USA). Solar Energy Task Force	
	8:57057	DOE/R4/10090—T1
FG44-80R410093	Donaldson (Jesse C.), Cocoa, FL (USA)	
	8:57108	DOE/R4/10093—T1
FG44-80R410095	Florida Univ., Gainesville (USA)	
	8:57074	DOE/R4/10095—T1
	8:57075	DOE/R4/10095—T2
FG44-80R410096	Solar Engineering Co., Casselberry, FL (USA)	
	8:57076	DOE/R4/10096—T1
FG44-80R410097	Kanaly (David B.), Melbourne, FL (USA)	
	8:57064	DOE/R4/10097—T1
FG44-80R410101	Energy Alternatives, Longwood, FL (USA)	
	8:57077	DOE/R4/10101—T1
FG44-80R410104	SOLARFIN, St. Augustine, FL (USA)	
	8:57078	DOE/R4/10104—T1
FG44-80R410109	Cam Dyanmics, Inc., Memphis, TN (USA)	
	8:57271	DOE/R4/10109—T1
FG44-80R410114	Jeter (Sheldon M.), Atlanta, GA (USA)	
	8:57079	DOE/R4/10114—T1
FG44-80R410115	Vanderhoogt (Arthur), Atlanta, GA (USA)	
	8:57257	DOE/R4/10115—T1
FG44-80R410119	Charlotte Area Fund, Inc., NC (USA)	
	8:57080	DOE/R4/10119—T1
FG44-80R410124	Ross (Joseph C.), Rossville, GA (USA)	
	8:57258	DOE/R4/10124—T1
FG44-80R410125	Georgia Univ., Athens (USA)	
	8:57034	DOE/R4/10125—T1
FG44-80R410134	Georgia Univ., Athens (USA)	
	8:57025	DOE/R4/10134—T1
FG44-80R410138	Solar Plexus Design, Warne, NC (USA)	
	8:57081	DOE/R4/10138—T1
FG44-80R410141	North Carolina State Univ., Raleigh (USA). Dept. of Mechanical and Aerospace Engineering	
	8:57082	DOE/R4/10141—T1
FG44-80R410149	North Georgia Coll., Dahlonega (USA)	
	8:57109	DOE/R4/10149—T1
FG44-80R410155	Kentucky Univ., Lexington (USA). Dept. of Mechanical Engineering	
	8:57083	DOE/R4/10155—T1
FG44-80R410166	Vanderbilt Univ., Nashville, TN (USA)	
	8:57004	DOE/R4/10166—T1
FG44-80R410169	Florida Univ., Gainesville (USA). Dept. of Agronomy	
	8:57005	DOE/R4/10169—T1
FG44-80R410189	Appalachian State Univ., Boone, NC (USA)	
	8:57110	DOE/R4/10189—T1
FG44-80R410203	Shih (Jason C.H.), Raleigh, NC (USA)	
	8:57006	DOE/R4/10203—T1
FG44-80R410204	Shuder (C.B.), Boomer, NC (USA)	
	8:57084	DOE/R4/10204—T1
FG44-80R410212	Whitesides (R.E.), Lincolnton, NC (USA)	
	8:57111	DOE/R4/10212—T1
FG44-80R410216	Zurn (Elmer F.), Camden, SC (USA)	
	8:57026	DOE/R4/10216—T1
FG44-80R410217	Robison (Harry), Pawleys Island, SC (USA)	
	8:57085	DOE/R4/10217—T1
FG44-80R410221	Piedmont Technical Coll., Greenwood, SC (USA)	
	8:57086	DOE/R4/10221—T1
FG44-80R410223	South Carolina Dept. of Parks, Recreation and Tourism, Columbia (USA)	
	8:57290	DOE/R4/10223—T1
FG44-80R410231	Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center	
	8:57027	DOE/R4/10231—T1
	8:57028	DOE/R4/10231—T2
FG44-80R410237	Fitzcharles (Howard M. III), Smyrna, TN (USA)	
	8:57029	DOE/R4/10237—T1
FG44-80R410243	Tennessee Technological Univ., Cookeville (USA). Dept. of Mechanical Engineering	
	8:57039	DOE/R4/10243—T1
FG44-80R410254	Goerz (Jerry W.), Lexington, KY (USA)	
	8:57065	DOE/R4/10254—T1
FG44-80R410264	Georgia Power Co., Macon (USA)	
	8:57259	DOE/R4/10264—T1
FG44-80R410266	Rosander (R.T.), Young Harris, GA (USA)	
	8:57087	DOE/R4/10266—T1
FG44-80R410267	Albany Junior Coll., GA (USA)	
	8:57030	DOE/R4/10267—T1
FG44-80R410268	Shields Construction Co., Atlanta, GA (USA)	
	8:57088	DOE/R4/10268—T1
FG44-80R410278	Mississippi Dept. of Natural Resources, Jackson (USA). Bureau of Recreation and Parks	
	8:57260	DOE/R4/10278—T1
FG44-80R410284	Griggs (Fred H.), Dallas, TX (USA)	
	8:57112	DOE/R4/10284—T1
FG44-80R410288	Kerr (Oliver), Miami, FL (USA)	
	8:57285	DOE/R4/10288—T1
FG44-80R410290	Bodnaruk (William H., Jr.), Tavares, FL (USA)	
	8:57089	DOE/R4/10290—T1
FG44-80R410299	Florida Univ., Gainesville (USA)	
	8:57002	CONF-821257—1
FG44-80R410304	Leitman (Steve), Quincy, FL (USA)	
	8:57261	DOE/R4/10304—T1
FG44-80R410316	Pendola (William, Jr.), Sarasota, FL (USA)	
	8:57113	DOE/R4/10316—1
FG44-80R410318	Plank (Don), St. Petersburg, FL (USA)	
	8:57058	DOE/R4/10318—T1
FG44-80R410319	Klingman (Richard T.), West Palm Beach, FL (USA)	
	8:57114	DOE/R4/10319—T1
FG44-81R410403	Lane (F. Berry), Waddy, KY (USA)	
	8:57090	DOE/R4/10403—T1
FG44-81R410404	Edwards (R.G.), Lexington, KY (USA)	
	8:57262	DOE/R4/10404—T1

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FG44-81R410409	Alabama Univ., Huntsville (USA). Kenneth E. Johnson Environmental and Energy Center	
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	Symp. (Int.) Combust., [Proc.], 1181-1187(1982)			8:57528
	Symp. (Int.) Combust., [Proc.], 1223-1242(1982)			8:57603
	Symp. (Int.) Combust., [Proc.], 591-597(1982)			8:57758
CONF-820839-	(International conference on X-ray and VUV synchrotron radiation instrumentation, Hamburg, F.R. Germany, 9-13 Aug 1982)			
	Nucl. Instrum. Methods Phys. Res., 208: No. 1-3, 37-42(15 Apr 1983)			8:57559
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	Nucl. Instrum. Methods Phys. Res., 208: No. 1-3, 767-770(15 Apr 1983)			8:57577
	Nucl. Instrum. Methods Phys. Res., 208: No. 1-3, 379-386(15 Apr 1983)			8:57585
	Nucl. Instrum. Methods Phys. Res., 208: No. 1-3, 631-635(15 Apr 1983)			8:57586
	Nucl. Instrum. Methods Phys. Res., 208: No. 1-3, 245-249(15 Apr 1983)			8:57587
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CONF-8208101-	(4. international symposium on radiopharmaceutical chemistry, Juelich, F.R. Germany, 23-27 Aug 1982)			
	J. Labelled Compd. Radiopharm., 19: No. 11-12, 1323-1325(Nov-Dec 1982)			8:57478
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CONF-820933-	(International conference on radioactive waste management, Winnipeg, Manitoba, Canada, 12-15 Sep 1982)			
	NTIS, PC A02/MF A01	DE84000675	MN -70B	8:56989

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CONF-820945-	(International conference on ion beam modification of materials, Grenoble, France, 6-10 Sep 1982)			
12	NTIS, PC A02/MF A01; 1	DE84000641	MN -25	8:57369
CONF-820948-	(12. symposium on fusion technology, Juelich, F.R. Germany, 13-17 Sep 1982)			
13	NTIS, PC A02/MF A01; 1	DE84000643	MN -20	8:57961
CONF-820956-	(13. general meeting of the International Mineralogical Association, Varna, Bulgaria, 19-25 Sep 1982)			
Abstr.	*See* INIS-mf-8575	DE83781087	MN -34	8:58001
CONF-820979-	(International conference on nucleus-nucleus collisions, East Lansing, MI, USA, 27 Sep-1 Oct 1982)			
	Nucl. Phys. A, 400: 295c-313c(23 May 1983)			8:57888
CONF-8209134-	(IAEA interregional training course on waste management in nuclear facilities, Karlsruhe, F.R. Germany, 6 Sep-1 Oct 1982)			
23	*See* INIS-mf-8545	DE83703585	MN -11	8:57605
CONF-8209154-	(3. Austrian-Italian-Yugoslav chemical engineering conference and 276. meeting of the European Federation of Chemical Engineering, Graz, Austria, 14-16 Sep 1982)			
Vol.1	*See* INIS-mf-8537	DE84780008	MN -4	8:57496
CONF-821007-	(Annual geothermal resources council meeting, San Diego, CA, USA, 11-14 Oct 1982)			
14	*See* LBL-14519	DE84001041	MN -66a	8:57104
CONF-821015-	(Electrochemical Society fall meeting, Detroit, MI, USA, 17-22 Oct 1982)			
13	*See* N-8322757			8:57254
CONF-821077-	(Atomic Industrial Forum conference on radiation issues for the nuclear industry, New Orleans, LA, USA, 3-6 Oct 1982)			
	Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Bethesda, MD 20814,, $150.00			8:57708
CONF-821089-	(6. international workshop on laser interaction and related plasma phenomena, Monterey, CA, USA, 25-29 Oct 1982)			
14	*See* NRL-MR-5170	DE84000640	MN -21	8:57986
CONF-821143-	(High angular momentum properties of nuclei conference, Oak Ridge, TN, USA, 2-4 Nov 1982)			
10	NTIS, PC A02/MF A01	DE84001393	MN -34C	8:57897
CONF-8211109-	(8. Brazilian meeting on welding technology, Rio de Janeiro, Brazil, 21-24 Nov 1982)			
1	*See* INIS-BR-54	DE83781126	MN -25	8:57333
2	*See* INIS-BR-55	DE83781127	MN -25	8:57334
3	*See* INIS-BR-56	DE83781128	MN -25	8:57335
CONF-8211110-	(National radiobiology conference, Stary Smokovec, Czechoslovakia, 21-25 Nov 1982)			
	See INIS-mf-8561	DE83781134	MN -48	8:57700
CONF-821248-	(3. Brazilian congress on materials science and engineering, Porto Alegre, Brazil, 13-15 Dec 1982)			
1	*See* INIS-BR-35	DE83781108	MN -25	8:57500
2	*See* INIS-BR-34	DE83781109	MN -25	8:57376
3	*See* INIS-BR-37	DE83781110	MN -25	8:57320
4	*See* INIS-BR-38	DE83781111	MN -25	8:57321
5	*See* INIS-BR-40	DE83781112	MN -25	8:57322
6	*See* INIS-BR-41	DE83781113	MN -25	8:57323
7	*See* INIS-BR-42	DE83781114	MN -25	8:57324
8	*See* INIS-BR-43	DE83781115	MN -25	8:57325
9	*See* INIS-BR-44	DE83781116	MN -25	8:57326
10	*See* INIS-BR-45	DE83781117	MN -25	8:57327
11	*See* INIS-BR-46	DE83781118	MN -25	8:57378
12	*See* INIS-BR-47	DE83781119	MN -25	8:57379
13	*See* INIS-BR-48	DE83781120	MN -25	8:57328
14	*See* INIS-BR-49	DE83781121	MN -25	8:57329
15	*See* INIS-BR-50	DE83781122	MN -25	8:57330
16	*See* INIS-BR-51	DE83781123	MN -25	8:57331
17	*See* INIS-BR-52	DE83781124	MN -25	8:57332
18	*See* INIS-BR-33	DE83781130	MN -25	8:57375
19	*See* INIS-BR-36	DE83781131	MN -25	8:57377
CONF-821252-	(Seminar on /gamma gamma/-physics, Montpellier, France, 9-10 Dec 1982)			
1	*See* BONN-HE-83-2	DE83751137	MN -34D	8:57854
CONF-821257-	(American Society of Agricultural Engineers winter meeting, Chicago, IL, USA, 14-17 Dec 1982)			
1	NTIS, PC A02/MF A01	DE84000925	MN -59b	8:57002
CONF-830149-	(3. finite element methods in flow problems, Austin, TX, USA, 23-26 Jan 1983)			
2	*See* UCRL-89094	DE84000916	MN -34A	8:57853
CONF-830301-	(ASME-JSME thermal engineering joint conference, Honolulu, HI, USA, 20-24 Mar 1983)			
20	*See* LBL-14984	DE84001045	MN -94a	8:57204
CONF-830393-	(ANS western regional student conference, Santa Barbara, CA, USA, 25-27 Mar 1983)			
Abstr.	*See* DOE/ER/75094-1	DE84001385	MN -2	8:57154
CONF-830406-	(3. topical meeting on technology of fusion energy, Knoxville, TN, USA, 26-28 Apr 1983)			
112	*See* LBL-15616	DE84001328	MN -20a	8:57985

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CONF-8304126-	(Calorimeter calibration workshop, Batavia, IL, USA, 29-30 Apr 1983)			
1	*See* ANL-HEP-CP-83-48	DE84000594	MN -28	8:57546
CONF-830528-	(7. international symposium on packaging and transportation of radioactive materials, New Orleans, LA, USA, 15-20 May 1983)			
60	*See* SAND-82-2018C	DE84001285	MN -71	8:57505
CONF-830549-	(7. annual EPRI contractors' conference on coal liquefaction, Palo Alto, CA, USA, 11-13 May 1983)			
2	*See* LBL-15985	DE84001326	MN -90a	8:56831
CONF-830563-	(Enlarged halden program group meeting, Loen, Norway, 23-28 May 1983)			
4	*See* KFK-3506	DE83751142	MN -25	8:57346
CONF-8305108-	(Symposium on particle induced mass spectroscopy of involatile molecules, College Station, TX, USA, 16-18 May 1983)			
2	*See* LBL-16040	DE84001097	MN -4	8:57477
CONF-8305110-	(Fronts, interfaces and patterns conference, Los Alamos, NM, USA, 2-6 May 1983)			
3	*See* LA-UR-83-2862	DE84001018	MN -32	8:58009
CONF-8305114-	(Riso international conference on the use of simulation models in energy planning, Riso, Denmark, 9-11 May 1983)			
	Energy Systems Group, Risoe National Laboratory, DK-4000 Roskilde, Denmark			8:57229
CONF-8305127-	(Spring college on radiation in plasmas, Trieste, Italy, 24 May-17 Jun 1983)			
2	*See* LA-UR-83-2840	DE84001038	MN -21	8:57984
CONF-8305137-	(Photo/biological hydrogen annual review meeting, Golden, CO, USA, 20 May 1983)			
1	*See* SERI/TP-235-1987	DE84000003	MN -61b	8:56999
CONF-830609-	(ANS annual meeting, Detroit, MI, USA, 12-17 Jun 1983)			
	Trans. Am. Nucl. Soc., 44: 310-311(Jun 1983)			8:57150
	Trans. Am. Nucl. Soc., 44: 311-314(Jun 1983)			8:57151
	Trans. Am. Nucl. Soc., 44: 264-265(Jun 1983)			8:57156
	Trans. Am. Nucl. Soc., 44: 265-266(Jun 1983)			8:57157
	Trans. Am. Nucl. Soc., 44: 268-269(Jun 1983)			8:57158
	Trans. Am. Nucl. Soc., 44: 269-270(Jun 1983)			8:57159
	Trans. Am. Nucl. Soc., 44: 281-283(Jun 1983)			8:57160
	Trans. Am. Nucl. Soc., 44: 225-227(Jun 1983)			8:57161
	Trans. Am. Nucl. Soc., 44: 70(Jun 1983)			8:57165
	Trans. Am. Nucl. Soc., 44: 290-291(Jun 1983)			8:57170
	Trans. Am. Nucl. Soc., 44: 297-299(Jun 1983)			8:57192
	Trans. Am. Nucl. Soc., 44: 300-301(Jun 1983)			8:57193
	Trans. Am. Nucl. Soc., 44: 305-306(Jun 1983)			8:57194
	Trans. Am. Nucl. Soc., 44: 309(Jun 1983)			8:57195
	Trans. Am. Nucl. Soc., 44: 162-163(Jun 1983)			8:57196
	Trans. Am. Nucl. Soc., 44: 175-176(Jun 1983)			8:57197
	Trans. Am. Nucl. Soc., 44: 176-179(Jun 1983)			8:57198
	Trans. Am. Nucl. Soc., 44: 295-297(Jun 1983)			8:57199
	Trans. Am. Nucl. Soc., 44: 9(Jun 1983)			8:57255
CONF-830640-	(ASHRAE conference, Washington, DC, USA, 26-30 Jun 1983)			
9	*See* LBL-15636	DE84000937	MN -95d	8:57264
CONF-830689-	(14. international symposium on multiparticle dynamics, Lake Tahoe, NV, USA, 22-27 Jun 1983)			
5	*See* SLAC-PUB-3127	DE84000993	MN -34D	8:57864
6	*See* SLAC-PUB-3166	DE84000994	MN -34D	8:57871
7	*See* LA-UR-83-2610	DE84001345	MN -34D	8:57863
CONF-8306110-	(2. Pisa meeting on advanced detectors, Castiglione della Pescaia, Italy, 2-8 Jun 1983)			
2	*See* SLAC-PUB-3131	DE84000928	MN -28	8:57574
CONF-8306128-	(IAEA coordinated research programme on applications of nuclear related techniques in occupational health, Lund, Sweden, 13-18 Jun 1983)			
1	*See* BNL-33667	DE84000538	MN -41	8:57658
CONF-8306129-	(15. IEEE power modulator symposium, Baltimore, MD, USA, 14-16 Jun 1983)			
1	*See* UCRL-87670	DE84000473	MN -21	8:57989
CONF-8306130-	(17. annual conference on trace substances in environmental health, Columbia, MO, USA, 13-16 Jun 1983)			
1	*See* DOE/EV/03490-2302	DE84000854	MN -48	8:57681
CONF-830704-	(9. international colloquium on dynamics of explosions and reactive systems, Poitier, France, 3-8 Jul 1983)			
9	*See* UCRL-88760	DE84001157	MN -45	8:57590
CONF-830711-	(16. American Carbon Society biennial conference, La Jolla, CA, USA, 17-22 Jul 1983)			
5	*See* PNL-SA-10932	DE83016184	MN -77	8:57145
CONF-830718-	(International Europhysics conference on high energy physics, Brighton, UK, 20-27 Jul 1983)			
9	*See* DOE/ER/40033-50	DE83016326	MN -34D	8:57859
10	*See* DOE/ER/40033-51	DE84001258	MN -34D	8:57860
11	*See* SLAC-PUB-3196	DE84001256	MN -34D	8:57865
CONF-830759-	(16. annual technical meeting of the International Metallographic Society, Calgary, Canada, 25-28 Jul 1983)			
2	*See* EGG-M-00483	DE84000898	MN -90c	8:56829

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CONF-830797-	(Workshop on high energy transients, Santa Cruz, CA, USA, 11-22 Jul 1983)			
3	*See* UCRL-89862	DE84000917	MN -34B	8:57789
4	*See* LA-UR-83-2844	DE84001039	MN -34B	8:57772
CONF-830798-	(3. LAMPF II workshop, Los Alamos, NM, USA, 18-29 Jul 1983)			
3	*See* LBL-16541	DE84001037	MN -34D	8:57870
CONF-8307101-	(Modeling of casting and welding processes conference, Henniker, NH, USA, 31 Jul-5 Aug 1983)			
1	*See* SAND-83-1120C	DE84001292	MN -38	8:57498
CONF-8307102-	(International symposium on nucleon-nucleon interaction and nuclear many-body problems, Beijing, China, 1 Jul-1 Aug 1983)			
1	*See* LA-UR-83-2851	DE84001017	MN -34C	8:57905
CONF-830805-	(7. international conference on structural mechanics in reactor technology, Chicago, IL, USA, 22-26 Aug 1983)			
59	*See* EGG-M-17682	DE84001049	MN -78	8:57172
CONF-830807-	(International conference on coal science, Pittsburgh, PA, USA, 15-19 Aug 1983)			
13	*See* LBL-15936	DE84001079	MN -90a	8:56830
CONF-830811-	(Conference on quantitative NDE, Santa Cruz, CA, USA, 7-12 Aug 1983)			
16	*See* SAND-83-0971	DE84001644	MN -25	8:57516
CONF-830812-	(18. intersociety energy conversion engineering conference, Orlando, FL, USA, 21-26 Aug 1983)			
57	*See* EGG-M-00183	DE84000893	MN -66a	8:57105
CONF-830822-	(12. international conference on high energy accelerators, Batavia, IL, USA, 11-16 Aug 1983)			
28	*See* SLAC-PUB-3182	DE84000933	MN -28	8:57567
29	*See* SLAC-PUB-3175	DE84000990	MN -28	8:57542
30	*See* SLAC-PUB-3173	DE84000991	MN -28	8:57541
31	*See* SLAC-PUB-3184	DE84000992	MN -28	8:57543
32	*See* SLAC-PUB-3174	DE84000989	MN -28	8:57558
CONF-830833-	(International conference on nuclear physics, Florence, Italy, 29 Aug-3 Sep 1983)			
2	*See* LBL-16390	DE84000722	MN -34C	8:57906
CONF-830847-	(Energy resource management '83, San Francisco, CA, USA, 23-27 Aug 1983)			
4	*See* PNL-SA-11648	DE84001415	MN -70	8:56970
CONF-830874-	(27. annual international technical symposium on high speed photography, videography and photonics, San Diego, CA, USA, 21-26 Aug 1983)			
27	*See* LA-UR-83-2290	DE83017605	MN -38	8:57582
28	NTIS, PC A02/MF A01	DE84000614	MN -34A	8:57549
CONF-830899-	(Annual meeting of American Statistical Association and other statistical groups, Toronto, Canada, 15-18 Aug 1983)			
4	*See* UCRL-89893	DE84001234	MN -32	8:58016
CONF-8308106-	(5. annual participants information meeting of DOE low level waste management program, Denver, CO, USA, 30 Aug-1 Sep 1983)			
8	*See* DP-MS-83-88	DE84000828	MN -70B	8:56958
14	*See* BNL-33675	DE84001158	MN -70B	8:56951
15	*See* LA-UR-83-2589	DE84001358	MN -70B	8:56967
16	*See* LA-UR-83-2590	DE84001351	MN -70B	8:56983
17	NTIS, PC A02/MF A01	DE84000343	MN -70B	8:56952
19-Rev.	*See* DP-MS-83-89-Rev.	DE84001622	MN -70B	8:56979
20	*See* PNL-SA-11475	DE84001413	MN -70B	8:56986
CONF-8308122-	(North American Data General Users Group conference, Toronto, Ontario, Canada, 30 Aug 1983)			
1	*See* SAND-83-1656C	DE83017155	MN -71	8:56949
CONF-8308128-	(American Meteorological Society short course on instruments and techniques for probing the atmospheric boundary layer, Boulder, CO, USA, 8-12 Aug 1983)			
1	*See* BNL-33585	DE84000857	MN -11	8:57599
CONF-830910-	(3. national conference on synchrotron radiation instrumentation, Upton, NY, USA, 12-14 Sep 1983)			
3	*See* BNL-33694	DE84001461	MN -37	8:57580
CONF-830911-	(5. international conference on high power particle beams, San Francisco, CA, USA, 12-14 Sep 1983)			
13	*See* SAND-83-0629C	DE84000118	MN -34A	8:57799
16	*See* SAND-83-0223C	DE84000117	MN -28	8:57534
18	*See* SAND-83-0607C	DE84000357	MN -28	8:57556
19	*See* SAND-83-0608C	DE84000457	MN -28	8:57557
20	*See* SAND-83-0590C	DE84000356	MN -28	8:57555
21	*See* SAND-83-0610C	DE84000458	MN -20	8:57988
22	*See* SAND-83-1963C	DE84000456	MN -28	8:57539
23	*See* LA-UR-83-2588	DE84001357	MN -28	8:57536
24	*See* LA-UR-83-2580	DE84001362	MN -34	8:57926
25	*See* UCRL-89867	DE84001237	MN -28	8:57508
26	*See* LA-UR-83-2601	DE84000369	MN -34	8:57982
27	*See* LA-UR-83-2602	DE84001346	MN -34	8:57983
29	*See* LA-UR-83-2671	DE84001323	MN -34	8:57928
30	*See* LA-UR-83-2670	DE84001336	MN -34	8:57927

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CONF-830918-	(CEP international conference on heavy metals in the environment, Heidelberg, F.R. Germany, 6-9 Sep 1983)			
2	NTIS, PC A02/MF A01	DE84000721	MN -11	8:57615
3	NTIS, PC A02/MF A01	DE84000720	MN -11	8:57600
4	*See* PNL-SA-11141	DE84000114	MN -11	8:57631
CONF-830936-	(Symposium on atomic spectroscopy (SAS-83), Berkeley, CA, USA, 12-16 Sep 1983)			
Abstr.	*See* LBL-16509	DE84001047	MN -34A	8:57798
CONF-830939-	(Waterpower '83 - international conference on hydropower, Knoxville, TN, USA, 18-21 Sep 1983)			
3	NTIS, PC A02/MF A01	DE84000204	MN -97e	8:57037
4	NTIS, PC A02/MF A01	DE84000687	MN -97e	8:57038
CONF-830942-	(3. topical meeting on fusion reactor materials, Albuquerque, NM, USA, 19-23 Sep 1983)			
17	NTIS, PC A02/MF A01	DE84000337	MN -20c	8:57962
18	NTIS, PC A02/MF A01	DE84000716	MN -20c	8:57294
19	NTIS, PC A02/MF A01	DE84000412	MN -20c	8:57295
20	NTIS, PC A02/MF A01; 1	DE84000724	MN -20a	8:57963
23	NTIS, PC A02/MF A01	DE84000572	MN -20c	8:57964
31	*See* EGG-M-18083	DE84000805	MN -20c	8:57303
32	*See* EGG-M-09283	DE84000804	MN -20c	8:57972
34	NTIS, PC A02/MF A01; 1	DE84000691	MN -20c	8:57965
36	*See* LA-UR-83-2567	DE84001400	MN -20d	8:57979
37	*See* LA-UR-83-2572	DE84001359	MN -20c	8:57347
38	NTIS, PC A02/MF A01	DE84000569	MN -20c	8:57966
39	*See* LA-UR-83-2570	DE84001366	MN -20d	8:57981
40	*See* LA-UR-83-2783	DE84001304	MN -20c	8:57383
41	*See* DOE/ER/10107-20	DE84001277	MN -20c	8:57299
42	*See* DOE/ER/10107-19	DE84001296	MN -20c	8:57298
43	*See* DOE/ER/10107-17	DE84001298	MN -20c	8:57296
44	*See* DOE/ER/10107-18	DE84001297	MN -20c	8:57297
45	*See* DOE/ET/52027-7	DE84001299	MN -20c	8:57302
46	*See* LA-UR-83-2742	DE84001311	MN -20c	8:57348
CONF-830969-	(12. international conference on solid state nuclear track detectors, Acapulco, Mexico, 4-10 Sep 1983)			
1	*See* PNL-SA-11213	DE84000113	MN -37	8:57572
CONF-830970-	(International symposium on highly excited states and nuclear structure, Orsay, France, 5-8 Sep 1983)			
1	*See* LA-UR-83-2587	DE84001356	MN -34C	8:57895
CONF-830980-	(Passive and hybrid solar energy program update conference, Washington, DC, USA, 26-28 Sep 1983)			
2	*See* LA-UR-83-2647	DE84001340	MN -59c	8:57094
3	*See* LA-UR-83-2646	DE84001341	MN -59c	8:57093
CONF-830991-	(7. national Nuclear Records Management Association symposium, Atlanta, GA, USA, 12-14 Sep 1983)			
1	*See* EGG-M-11483	DE84000661	MN -13	8:58004
CONF-830999-	(34. ISE meeting, Erlanger, F.R. Germany, 18-23 Sep 1983)			
2	*See* LBL-16235	DE84000957	MN -94cc	8:57210
CONF-8309133-	(10. international congress on X-ray optics and microanalysis, Toulouse, France, 5-9 Sep 1983)			
2	NTIS, PC A02/MF A01	DE84000588	MN -25	8:57426
CONF-8309137-	(2. European workshop on computational problems in the calculation of MHD equilibria, Wildhaus, Switzerland, 12-14 Sep 1983)			
3	NTIS, PC A03/MF A01; 1	DE84000723	MN -20	8:57916
CONF-8309144-	(EPS conference on computing in accelerator design and operation, Berlin, F.R. Germany, 20-23 Sep 1983)			
3	NTIS, PC A02/MF A01	DE84000335	MN -28	8:57550
4	*See* LA-UR-83-2703	DE84001335	MN -28	8:57538
5	*See* LA-UR-83-2702	DE84001330	MN -28	8:57537
CONF-8309149-	(5. international conference on finite elements, Austin, TX, USA, 26-29 Sep 1983)			
1	*See* SAND-82-2903C	DE84000452	MN -25	8:57389
CONF-8309152-	(Joint Utah conference on industrial hygiene and safety, Salt Lake City, UT, USA, 21 Sep 1983)			
1	NTIS, PC A02/MF A01	DE84000727	MN -41	8:57722
CONF-8309153-	(Seminar on measurements and calculations on the replica of Little Boy, Los Alamos, NM, USA, 13-14 Sep 1983)			
1	NTIS, PC A02/MF A01	DE84000715	MN -41	8:57910
CONF-8309154-	(Parallel computing '83, Berlin, F.R. Germany, 26 Sep 1983)			
1	*See* UCRL-89740	DE84000469	MN -32	8:58015
CONF-8309155-	(International conference on lasers, Guangzhou, China, 6-9 Sep 1983)			
1	*See* UCRL-88814	DE84000159	MN -21	8:57990
2	*See* LA-UR-83-2568	DE84001365	MN -21	8:57980
CONF-8309156-	(7. meeting of the international collaboration on advanced neutron sources, Ontario, Canada, 12-16 Sep 1983)			
1	NTIS, PC A02/MF A01	DE84000311	MN -28	8:57533
2	*See* LA-UR-83-2593	DE84001354	MN -38	8:57566
3	*See* LA-UR-83-2592	DE84001353	MN -28	8:57565
5	*See* LA-UR-83-2692	DE84001317	MN -28	8:57553
CONF-8309157-	(4. international symposium on high voltage engineering, Athens, Greece, 5-9 Sep 1983)			
1	NTIS, PC A02/MF A01	DE84000689	MN -97a	8:57131
2	NTIS, PC A02/MF A01	DE84000688	MN -97b	8:57519

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CONF-8309158-	(3. international colloquium on welding and melting by electrons and laser beams, Lyon, France, 5-9 Sep 1983)			
1	*See* MLM-3105(OP)	DE84000362	MN -38	8:57497
CONF-8309160-	(Association for the Advancement of Modelling and Simulation Techniques in Enterprises summer conference, Nice, France, 12-14 Sep 1983)			
1	NTIS, PC A03/MF A01; 1	DE84000690	MN -11	8:57723
CONF-8309161-	(Symposium on high temperature solid oxide electrolytes, Upton, NY, USA, 16-18 Sep 1983)			
1	*See* PNL-SA-11544	DE84000150	MN -94cc	8:57385
CONF-8309163-	(Conference on low energy tests of conservation laws in particle physics, Blacksburg, VA, USA, 12-14 Sep 1983)			
1	*See* LA-UR-83-2648	DE84001339	MN -34C	8:57874
CONF-8309166-	(2. international conference on carbonaceous particles in the atmosphere, Linz, Austria, 11-14 Sep 1983)			
1	*See* LBL-16106	DE84000400	MN -37	8:57583
CONF-831011-	(American Vacuum Society symposium, Boston, MA, USA, 31 Oct-4 Nov 1983)			
1	*See* UCRL-89166	DE84000915	MN -20a	8:57992
2	*See* SAND-83-2094C	DE84000926	MN -32	8:57801
3	*See* UCRL-89299	DE84001449	MN -25	8:57292
CONF-831025-	(26. ORNL-DOE conference on analytical chemistry in energy technology, Knoxville, TN, USA, 11-13 Oct 1983)			
2	*See* LA-UR-83-2613	DE84001347	MN -4	8:56942
4	*See* DP-MS-83-57	DE84001408	MN -04	8:57432
10	*See* DP-MS-83-44	DE84001592	MN -10	8:57431
CONF-8310111-	(11. DOE annual compatibility meeting, Livermore, CA, USA, 18-20 Oct 1983)			
4-Rev.1	*See* UCRL-89188-Rev.1	DE84001402	MN -4	8:57592
CONF-8310161-	(3. international conference on entity-relationship approach, Anaheim, CA, USA, 5-7 Oct 1983)			
1	NTIS, PC A02/MF A01	DE84000592	MN -32	8:58007
CONF-8310162-	(Western gas sands sub-program review meeting, Morgantown, WV, USA, 18-19 Oct 1983)			
3	*See* SAND-83-2102C	DE84000484	MN -92a	8:57739
8	*See* UCRL-89890	DE84001435	MN -91	8:56917
CONF-8310163-	(18. international thermal conductivity conference, Rapid City, SD, USA, 3-5 Oct 1983)			
3	*See* SAND-83-2109C	DE84000945	MN -38	8:57584
CONF-8310168-	(HP 1000 international users group conference, Fort Worth, TX, USA, 18-21 Oct 1983)			
2	*See* UCRL-89129	DE84001232	MN -32	8:58014
CONF-8310171-	(34. International Astronautical Federation conference, Budapest, Hungary, 10-17 Oct 1983)			
1	*See* UCRL-88857	DE84001238	MN -21	8:57991
CONF-831101-	(International symposium on fracture mechanics, Beijing, China, 22-25 Nov 1983)			
1	*See* SAND-82-2343	DE83007296	MN -35	8:57756
CONF-831111-	(ASME winter annual meeting, Boston, MA, USA, 13-18 Nov 1983)			
2	*See* DP-MS-83-5	DE84001596	MN -38	8:57510
CONF-831152-	(Symposium on application and assessment of automated tools for software development, San Francisco, CA, USA, 1 Nov 1983)			
1	*See* LA-UR-83-1893	DE83014146	MN -32	8:58005
CONF-831171-	(American Vacuum Society meeting, Boston, MA, USA, 1-4 Nov 1983)			
4	*See* UCRL-89325	DE84000184	MN -25	8:57359
6	*See* SAND-83-1918C	DE84000946	MN -34A	8:57800
CONF-831235-	(22. IEEE conference on decision control, San Antonio, TX, USA, 14 Dec 1983)			
1	NTIS, PC A02/MF A01; 1	DE83012084	MN -97	8:58000
COO-				
473-13	*See* DOE/ER/04073-13	DE84001280	MN -4	8:57427
2218-295	*See* DOE/ET/52040-T17	DE84001279	MN -20a	8:57919
4052-61	*See* DOE/ER/04052-61	DE84001398	MN -34C	8:57898
CW-WR-				
78-036.11B	*See* DOE/ET/12307-1450	DE84001832	STD -90e	8:57525
78-036.72	*See* DOE/ET/12307-1433	DE84001059	STD -90e	8:57523
78-036.76	*See* DOE/ET/12307-1434	DE84001058	STD -90e	8:57524
78-036.79	*See* DOE/ET/12307-1469	DE84001057	STD -90e	8:57526
DESY-				
83-013	NTIS (US Sales Only), PC A02/MF A01	DE83751085	MN -34D	8:57875
83-015	NTIS (US Sales Only), PC A02/MF A01	DE83751113	MN -34D	8:57876
83-016	NTIS (US Sales Only), PC A03/MF A01	DE83751112	MN -34D	8:57877
83-017	NTIS (US Sales Only), PC A02/MF A01	DE83751114	MN -34D	8:57855
83-018	NTIS (US Sales Only), PC A02/MF A01	DE83751115	MN -34D	8:57856
83-019	NTIS (US Sales Only), PC A02/MF A01	DE83751116	MN -34D	8:57857
83-020	NTIS (US Sales Only), PC A02/MF A01	DE83751117	MN -38	8:57499
83-021	NTIS (US Sales Only), PC A02/MF A01	DE83751118	MN -34D	8:57878
83-023	NTIS (US Sales Only), PC A03/MF A01	DE83751127	MN -37	8:57569
83-024	NTIS (US Sales Only), PC A03/MF A01	DE83751128	MN -34D	8:57867
83-025	NTIS (US Sales Only), PC A02/MF A01	DE83751126	MN -37	8:57570
83-026	NTIS (US Sales Only), PC A03/MF A01	DE83751269	MN -34D	8:57879
83-027	NTIS (US Sales Only), PC A02/MF A01	DE83751267	MN -34D	8:57880

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83-028	NTIS (US Sales Only), PC A02/MF A01	DE83751272	MN -28	8:57564
83-029	NTIS (US Sales Only), PC A02/MF A01	DE83751271	MN -34D	8:57858
83-030	NTIS (US Sales Only), PC A02/MF A01	DE83751270	MN -34D	8:57868
83-031	NTIS (US Sales Only), PC A02/MF A01	DE83751268	MN -34D	8:57851
DESY-L-Trans-276	Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany, F.R.)			8:57578
DOE/BC/10069-22	NTIS, PC A09/MF A01	DE84001684	STD -92a	8:56897
DOE/BC/10114-12	NTIS, PC A07/MF A01; 1	DE84000133	STD -91	8:57289
DOE/BC/10321-12	NTIS, PC A10/MF A01; 1	DE83017371	STD -92a	8:56898
DOE/CE/15130-T2	NTIS, PC A02/MF A01	DE84000819	MN -88	8:56857
DOE/CE/71115-1	NTIS, PC A03/MF A01; 1	DE83018121	STD -63	8:57095
DOE/CE/76007-1	NTIS, PC A04/MF A01	DE84001628	STD -97a	8:57130
DOE/CS/30574-T7	NTIS, PC A06/MF A01; 1	DE84000459	MN -59c	8:57069
DOE/CS/30583-T1	NTIS, PC A06/MF A01; 1	DE84000461	MN -59c	8:57096
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DOE/CS/40033-T5	NTIS, PC A06/MF A01	DE84000144	MN -95f	8:57275
DOE/DP/40139-2	NTIS, PC A02/MF A01	DE84001394	MN -21	8:57967
DOE/DP/40152-T2	NTIS, PC A02/MF A01	DE84000823	MN -21	8:57968
T3	NTIS, PC A02/MF A01	DE84000824	MN -21	8:57969
DOE/DP/40173-1	NTIS, PC A05/MF A01	DE84001374	MN -21	8:57507
DOE/EA-0166	NTIS, PC A04/MF A01	DE84001619	MN -61a	8:57022
DOE/EI/11548-T1	NTIS, PC A02/MF A01; 1		MN -98B	8:56901
DOE/EI/19619-T1	NTIS, PC A04/MF A01; 1	DE84000931	MN -98B	8:56902
DOE/EIA-0035(83/ 09)	NTIS, PC A06/MF A01 - GPO	DE84000924	MN -98	8:57250
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0420	NTIS MF A01; 2	DE84001378	MN -98	8:57251
0431	NTIS, PC A06/MF A01 - GPO	DE84001290	MN -98	8:57252
0432	NTIS, PC A08/MF A01	DE84001645	MN -88	8:56858
0433	NTIS, PC A14/MF A01	DE84001190	MN -88	8:56859
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0176	NTIS, PC A06/MF A01; 1	DE84001632	STD -28	8:57531
DOE/ER/03992-512	NTIS MF A01; 2	DE84001525	MN -34D	8:57882
DOE/ER/04052-61	NTIS, PC A02/MF A01	DE84001398	MN -34C	8:57898
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DOE/ER/04215-T1	NTIS, PC A02/MF A01	DE84001268	MN -34A	8:57884
DOE/ER/04837-8	NTIS, PC A03/MF A01; 1	DE83018200	MN -34C	8:57370
DOE/ER/10107-17	NTIS, PC A02/MF A01; 1	DE84001298	MN -20c	8:57296
18	NTIS, PC A02/MF A01; 1	DE84001297	MN -20c	8:57297
19	NTIS, PC A02/MF A01; 1	DE84001296	MN -20c	8:57298
20	NTIS, PC A02/MF A01; 1	DE84001277	MN -20c	8:57299
DOE/ER/10346-T4	NTIS, PC A04/MF A01; 1	DE84000839	MN -4	8:57766
DOE/ER/10461-T1	NTIS, PC A02/MF A01	DE84001105	MN -34	8:57300
DOE/ER/10578-T3	NTIS, PC A02/MF A01; 1	DE83018216	MN -34A	8:57792
DOE/ER/10855-3	NTIS, PC A02/MF A01	DE84001274	MN -4	8:57003
DOE/ER/10879-3	NTIS, PC A02/MF A01	DE84001104	MN -61a	8:57023
DOE/ER/10964-T1	NTIS, PC A06/MF A01; 1	DE84000999	MN -4	8:57481

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DOE/ER/13045-1	NTIS, PC A02/MF A01	DE84001567	MN -4	8:57483
DOE/ER/40033-50	NTIS, PC A02/MF A01	DE83016326	MN -34D	8:57859
51	NTIS, PC A02/MF A01	DE84001258	MN -34D	8:57860
DOE/ER/53098-2	NTIS, PC A02/MF A01	DE84001106	MN -20f	8:57971
DOE/ER/53136-5	NTIS, PC A02/MF A01	DE84001074	MN -20g	8:57917
DOE/ER/53138-T2	NTIS, PC A03/MF A01	DE84001429	MN -20f	8:57918
DOE/ER/60005-T1	NTIS, PC A02/MF A01	DE84001271	MN -41	8:57604
DOE/ER/71013-T3	NTIS, PC A02/MF A01	DE84000629	MN -4	8:57428
T5	NTIS, PC A04/MF A01	DE84000686	MN -4	8:57429
T6	NTIS, PC A02/MF A01	DE84001192	MN -4	8:57430
DOE/ER/71015-3	NTIS, PC A02/MF A01	DE84001170	MN -4	8:57447
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DOE/ET/12307-1433	NTIS, PC A02/MF A01; 1	DE84001059	STD -90e	8:57523
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1450	NTIS, PC A11/MF A01; 1	DE84001832	STD -90e	8:57525
1469	NTIS, PC A02/MF A01	DE84001057	STD -90e	8:57526
DOE/ET/12548-17	NTIS, PC A06/MF A01; 1	DE84000882	STD -88	8:56860
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DOE/EV/00641-51	NTIS, PC A03/MF A01	DE84001774	MN -11	8:57608
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DOE/EV/03490-2302	NTIS, PC A03/MF A01	DE84000854	MN -48	8:57681
DOE/EV/04361-T4	NTIS, PC A02/MF A01	DE84001278	MN -34A	8:57793
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DOE/EV/10259-1	NTIS MF A01; 2	DE84000871	MN -48	8:57654
DOE/EV/10270-4	NTIS, PC A02/MF A01	DE84001116	MN -48	8:57713
DOE/EV/10363-5	NTIS, PC A02/MF A01	DE84000834	MN -4	8:57476
DOE/EV/10721-1	NTIS, PC A02/MF A01; 1	DE84001125	MN -41	8:57688
DOE/EV/70024-59	NTIS, PC A02/MF A01	DE84001167	MN -11	8:57627
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DOE/ID/12371-5	NTIS, PC A02/MF A01	DE84001147	STD -70B	8:56953
DOE/IG-0198	USDOE-TIC, PO Bx 62, Oak Ridge, TN 37830		STD -13	8:57215
DOE/JPL-1012-79A	NTIS, PC A03/MF A01	DE84001226	STD -63b	8:57041
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DOE/NV/10162-11	NTIS, PC A03/MF A01; 1	DE84001227	MN -11	8:57593
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DOE/PC/40807-T8	NTIS, PC A02/MF A01	DE83018110	MN -90a	8:56870
DOE/PC/50254-T5	NTIS, PC A03/MF A01; 1	DE84001217	MN -90d	8:56872
DOE/PETC/TR-84/ 1	NTIS, PC A05/MF A01	DE84001332	STD -90i	8:56845
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DOE/R4/10088-T1	NTIS, PC A03/MF A01; 1	DE84000373	MN -92	8:56914
DOE/R4/10089-T1	NTIS, PC A02/MF A01; 1	DE84000374	MN -95d	8:57256
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T2	NTIS, PC A02/MF A01; 1	DE84000734	MN -59c	8:57075
DOE/R4/10096-T1	NTIS, PC A02/MF A01	DE84000732	MN -59c	8:57076
DOE/R4/10097-T1	NTIS, PC A02/MF A01	DE84000744	MN -59c	8:57064
DOE/R4/10101-T1	NTIS, PC A05/MF A01; 1	DE84000746	MN -59c	8:57077
DOE/R4/10104-T1	NTIS, PC A02/MF A01; 1	DE84000754	MN -59c	8:57078
DOE/R4/10109-T1	NTIS, PC A02/MF A01; 1	DE84000270	MN -96	8:57271
DOE/R4/10114-T1	NTIS, PC A04/MF A01	DE84000392	MN -59a	8:57079
DOE/R4/10115-T1	NTIS, PC A02/MF A01	DE84000777	MN -59a	8:57257
DOE/R4/10119-T1	NTIS, PC A02/MF A01; 1	DE84000277	MN -59b	8:57080
DOE/R4/10124-T1	NTIS, PC A02/MF A01	DE84000197	MN -95e	8:57258
DOE/R4/10125-T1	NTIS, PC A02/MF A01	DE84000811	MN -61a	8:57034
DOE/R4/10134-T1	NTIS, PC A03/MF A01	DE84000813	MN -61a	8:57025
DOE/R4/10138-T1	NTIS, PC A02/MF A01; 1	DE84000276	MN -59a	8:57081
DOE/R4/10141-T1	NTIS, PC A02/MF A01	DE84000389	MN -59a	8:57082
DOE/R4/10149-T1	NTIS, PC A02/MF A01	DE84000776	MN -60	8:57109
DOE/R4/10155-T1	NTIS, PC A07/MF A01; 1	DE84000426	MN -59c	8:57083
DOE/R4/10166-T1	NTIS, PC A02/MF A01; 1	DE84000668	MN -61a	8:57004
DOE/R4/10169-T1	NTIS, PC A05/MF A01; 1	DE84000752	MN -95f	8:57005
DOE/R4/10189-T1	NTIS, PC A02/MF A01; 1	DE84000287	MN -60	8:57110
DOE/R4/10203-T1	NTIS, PC A02/MF A01; 1	DE84000282	MN -61a	8:57006
DOE/R4/10204-T1	NTIS, PC A02/MF A01; 1	DE84000281	MN -59c	8:57084
DOE/R4/10212-T1	NTIS, PC A02/MF A01	DE84000432	MN -60	8:57111
DOE/R4/10216-T1	NTIS, PC A02/MF A01; 1	DE84000705	MN -61a	8:57026
DOE/R4/10217-T1	NTIS, PC A02/MF A01; 1	DE84000706	MN -59a	8:57085
DOE/R4/10221-T1	NTIS, PC A02/MF A01	DE84000699	MN -59a	8:57086
DOE/R4/10223-T1	NTIS, PC A03/MF A01	DE84000405	MN -96	8:57290
DOE/R4/10231-T1	NTIS, PC A07/MF A01; 1	DE84000709	MN -61a	8:57027
T2	NTIS, PC A04/MF A01; 1	DE84000402	MN -61a	8:57028
DOE/R4/10237-T1	NTIS, PC A02/MF A01; 1	DE84000398	MN -61a	8:57029
DOE/R4/10243-T1	NTIS, PC A04/MF A01; 1	DE84000404	MN -97e	8:57039
DOE/R4/10254-T1	NTIS, PC A02/MF A01	DE84000768	MN -60	8:57065
DOE/R4/10264-T1	NTIS, PC A02/MF A01	DE84000781	MN -95d	8:57259
DOE/R4/10266-T1	NTIS, PC A02/MF A01; 1	DE84000786	MN -59c	8:57087
DOE/R4/10267-T1	NTIS, PC A02/MF A01	DE84000783	MN -61a	8:57030
DOE/R4/10268-T1	NTIS, PC A02/MF A01; 1	DE84000784	MN -94e	8:57088

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DOE/R4/10278-T1	NTIS, PC A02/MF A01; 1	DE84000422	MN -95b	8:57260
DOE/R4/10284-T1	NTIS, PC A02/MF A01	DE84000789	MN -60	8:57112
DOE/R4/10288-T1	NTIS, PC A04/MF A01	DE84000753	MN -96	8:57285
DOE/R4/10290-T1	NTIS, PC A03/MF A01; 1	DE84000403	MN -59b	8:57089
DOE/R4/10304-T1	NTIS, PC A04/MF A01; 1	DE84000348	MN -95d	8:57261
DOE/R4/10316-1	NTIS, PC A02; 3	DE84000415	ND -60	8:57113
DOE/R4/10318-T1	NTIS, PC A02/MF A01	DE84000414	MN -63d	8:57058
DOE/R4/10319-T1	NTIS, PC A03/MF A01; 1	DE84000328	MN -60	8:57114
DOE/R4/10403-T1	NTIS, PC A02/MF A01	DE84000767	MN -59c	8:57090
DOE/R4/10404-T1	NTIS, PC A02/MF A01	DE84000437	MN -95d	8:57262
DOE/R4/10409-T1	NTIS, PC A04/MF A01; 1	DE84000438	MN -61a	8:57031
DOE/R4/10415-T1	NTIS, PC A03/MF A01	DE84000395	MN -97e	8:57040
DOE/R4/10423-T1	NTIS, PC A02/MF A01; 1	DE84000694	MN -59	8:57091
DOE/R4/10427-T1	NTIS, PC A04/MF A01	DE84001504	MN -90c	8:56911
DOE/R4/10435-T1	NTIS, PC A02/MF A01	DE84000713	MN -63	8:57044
DOE/R4/10437-T1	NTIS, PC A03/MF A01; 1	DE84000771	MN -95d	8:57263
DOE/R4/10445-T1	NTIS, PC A02/MF A01; 1	DE84000932	MN -59c	8:57092
DOE/R4/10447-T1	NTIS, PC A02/MF A01; 1	DE84000794	MN -61a	8:57032
DOE/R4/10448-T1	NTIS, PC A02/MF A01; 1	DE84000396	MN -96	8:57288
DOE/R4/10457-T1	NTIS, PC A02/MF A01	DE84000798	MN -96	8:57272
DOE/R4/10469-T1	NTIS, PC A02/MF A01	DE84000961	MN -61	8:57674
DOE/R4/10475-T1	NTIS, PC A02/MF A01; 1	DE84000325	MN -61a	8:57007
DOE/R4/10496-T1	NTIS MF A01; 2	DE84000696	MN -60	8:57115
DOE/R4/10503-T1	NTIS, PC A05/MF A01; 1	DE84000315	MN -60	8:57116
DOE/R5/10322-3	NTIS, PC A03/MF A01; 1	DE84001598	MN -95d	8:57286
DOE/RA-50297	NTIS MF A01; 2	DE84001309	MN -61a	8:57008
DOE/RA/50255-T2	NTIS, PC A05/MF A01	DE84000485	MN -97c	8:57245
DOE/RG-0064	NTIS, PC A08/MF A01	DE84001141	MN -90	8:57126
DOE/UMT-0215	NTIS, PC A03/MF A01	DE84001635	MN -70A	8:56978
DP-				
83-125-1	NTIS, PC A08/MF A01; 1	DE84001210	STD -70	8:56956
1606-Rev.1	NTIS, PC A04/MF A01; 1	DE84001627	STD -70	8:56957
1650	NTIS, PC A02/MF A01	DE84001680	STD -11	8:57594
DP-MS-				
83-5	NTIS, PC A02/MF A01; 1	DE84001596	MN -38	8:57510
83-44	NTIS, PC A02/MF A01	DE84001592	MN -10	8:57431
83-57	NTIS, PC A02/MF A01	DE84001408	MN -04	8:57432
83-88	NTIS, PC A02/MF A01; 1	DE84000828	MN -70B	8:56958
83-89-Rev.	NTIS, PC A02/MF A01	DE84001622	MN -70B	8:56979
83-92	NTIS, PC A05/MF A01	DE84001623	MN -11	8:57595
DP-tr-48	NTIS, PC A03/MF A01; 1	DE84001406	MN -4	8:57445
DPST-				
82-1076	NTIS, PC A02/MF A01	DE84000644	MN -11	8:57635
82-1085	NTIS, PC A07/MF A01	DE84001013	MN -80	8:57169
83-319	NTIS, PC A03/MF A01	DE84000830	MN -11	8:57689
83-671	NTIS, PC A02/MF A01; 1	DE84000639	MN -11	8:57636
83-673	NTIS, PC A02/MF A01; 1	DE84000203	MN -11	8:57637
83-693	NTIS, PC A02/MF A01	DE84000130	MN -11	8:57638
DSN-562	*See* CEA-CONF-6588	DE83703716	MN -25	8:57293
DT-				
8152-03	*See* DOE/ER/10964-T1	DE84000999	MN -4	8:57481
8152-04	*See* DOE/ER/10964-T3	DE84001000	MN -4	8:57482
E-				
83-10209	*See* N-8322687			8:56864

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ECN-				
83-095	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -90a	8:56846
83-099	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -60	8:57117
83-106	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -60	8:57118
83-108	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -60	8:57119
83-109	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -60	8:57120
EGG-				
1183-2419	NTIS, PC A03/MF A01	DE84000864	MN -70	8:56980
1183-2460	NTIS, PC A04/MF A01; 1	DE84000863	MN -70	8:56981
2274	*See* NUREG/CR-3462	DE84001521	MN -78	8:57188
10282-1004	NTIS, PC A02/MF A01; 1	DE84000440	STD -41	8:57617
10282-2004	NTIS, PC A03/MF A01	DE84000865	MN -70	8:56982
EGG-M-				
00183	NTIS, PC A02/MF A01; 1	DE84000893	MN -66a	8:57105
00483	NTIS, PC A02/MF A01	DE84000898	MN -90c	8:56829
09283	NTIS, PC A02/MF A01; 1	DE84000804	MN -20c	8:57972
11483	NTIS, PC A02/MF A01	DE84000661	MN -13	8:58004
17682	NTIS, PC A02/MF A01	DE84001049	MN -78	8:57172
18083	NTIS, PC A02/MF A01	DE84000805	MN -20c	8:57303
EGG-TMI-				
6272	NTIS, PC A02/MF A01	DE84000859	MN -78	8:57136
EPA-				
600/ 7-83-018	NTIS, PC A03/MF A01	DE83910834	MN -11	8:57714
EPRI-NP-				
2313-R2	*See* NUREG/CR-2575-R2	DE84900243	MN -78	8:57183
ESA-CR(P)-				
1646	*See* N-8321513			8:57059
ESA-STM-				
225	*See* N-8321514			8:57060
ESC-WR-				
83-06	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -98	8:57217
83-07	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -98	8:57218
83-11	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -11	8:57219
83-13	ECN, P.O. Box 1, 1755 ZG Petten, Netherlands		ND -98	8:57220
ESG-DOE-				
13408	NTIS, PC A03/MF A01	DE84001566	MN -80	8:57171
EUR-				
7796	NTIS (US Sales Only), PC A07/MF A01	DE83703717	MN -25	8:57304
7797	NTIS (US Sales Only), PC A03/MF A01	DE83703718	MN -25	8:57305
7821	NTIS (US Sales Only), PC A05/MF A01	DE83703719	MN -25	8:57306
7835-EN	Commission of the European Communities, Luxembourg			8:57106
7934	NTIS (US Sales Only), PC A05/MF A01	DE83703714	MN -86	8:56959
8036-EN	*See* PB-83-240648			8:57227
8051-EN	*See* PB-83-241356			8:57228
8172-EN	*See* PB-83-241976			8:57100
8217-EN	Commission of the European Communities, Luxembourg			8:57045
8242-EN	Commission of the European Communities, Luxembourg			8:57308
8292-EN	Commission of the European Communities, Luxembourg			8:57221
8294-EN	Commission of the European Communities, Luxembourg			8:57222
8320-EN	Commission of the European Communities, Luxembourg			8:57223
8362-EN	Commission of the European Communities, Luxembourg			8:57224
8369-EN	Commission of the European Communities, Luxembourg			8:57107
8396-EN	Commission of the European Communities, Luxembourg			8:57001
8630-FR	European Community Information Service, 2100 M Street, N.W., Suite 707, Washington, DC 20037		ND -63	8:57391
8636-EN	European Community Information Service, 2100 M Street, NW, Suite 707, Washington, DC 20037		MN -98D	8:57225
FEI-				
1293	NTIS (US Sales Only), PC A02/MF A01	DE83703720	MN -25	8:57309
FhG-W-				
6/ 82	NTIS (US Sales Only), PC A06/MF A01	DE83751146	MN -25	8:57513
7/ 81	NTIS (US Sales Only), PC A03/MF A01	DE83751147	MN -25	8:57310
FRNC-TH-				
1131	NTIS (US Sales Only), PC A10/MF A01	DE83781085	MN -34D	8:57850
1145	NTIS (US Sales Only), PC A09/MF A01	DE83781091	MN -34C	8:57890
FTD-ID(RS)T-				
0958-82	*See* N-8324465			8:57051
GA-A-				
17183	NTIS, PC A02/MF A01	DE84001009	STD -77	8:57141
GEAP-				
22053-R2	*See* NUREG/CR-2575-R2	DE84900243	MN -78	8:57183
GJBX-				
36(83)	NTIS, PC A03/MF A01	DE83017697	MN -51	8:56927
GKSS-				
81/ E/ 64	NTIS (US Sales Only), PC A02/MF A01	DE83751161	MN -11	8:57743
83/ E/ 4	NTIS (US Sales Only), PC A02/MF A01	DE83751159	MN -78	8:57163
83/ E/ 5	NTIS (US Sales Only), PC A03/MF A01	DE83751139	MN -80	8:57173
83/ E/ 6	NTIS (US Sales Only), PC A05/MF A01	DE83751138	MN -48	8:57433
83/ E/ 7	NTIS (US Sales Only), PC A02/MF A01	DE83751086	MN -79p	8:57174
GPO-				
95-066	*See* N-8322753			8:56904
97-152	*See* N-8321649			8:57234
98-172	*See* N-8322846			8:57596
99-464	*See* N-8322752			8:57246

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GSF-B-				
1509	NTIS (US Sales Only), PC A07/MF A01	DE83751148	MN -48	8:57680
GSF-K-				
91	NTIS (US Sales Only), PC A10/MF A01	DE83751105	MN -48	8:57690
GSF-R-				
290	NTIS (US Sales Only), PC A20/MF A01	DE83751090	MN -11	8:57736
291	NTIS (US Sales Only), PC A09/MF A01	DE83751136	MN -11	8:57737
GSI-				
82-17	NTIS (US Sales Only), PC A04/MF A01	DE83751083	MN -34C	8:57891
H-C-				
193-009-79-776D	*See* DOE/CS/40033-T5	DE84000144	MN -95f	8:57275
HMI-				
393	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.)			8:57885
IAEA-R-				
2506-F	NTIS (US Sales Only), PC A02/MF A01	DE83703736	MN -23	8:57691
IFD-				
2/ 82	NTIS (US Sales Only), PC A10/MF A01	DE83751162	MN -11	8:57851
IIUG-pre-				
82-4	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.)			8:57656
82-9	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.)			8:57233
IKE-				
2-60	NTIS (US Sales Only), PC A09/MF A01	DE83751124	MN -77	8:57142
6-141	NTIS (US Sales Only), PC A07/MF A01	DE83751135	MN -78	8:57133
ILR-				
54	NTIS (US Sales Only), PC A07/MF A01	DE83751282	MN -38	8:57511
INIS-BR-				
18	NTIS (US Sales Only), PC A02/MF A01	DE83781102	MN -25	8:57316
19	NTIS (US Sales Only), PC A02/MF A01	DE83781103	MN -25	8:57317
20	NTIS (US Sales Only), PC A02/MF A01	DE83781104	MN -80	8:57137
21	NTIS (US Sales Only), PC A02/MF A01	DE83781105	MN -25	8:57318
22	NTIS (US Sales Only), PC A02/MF A01	DE83781094	MN -45	8:57591
23	NTIS (US Sales Only), PC A02/MF A01	DE83781095	MN -4	8:57372
24	NTIS (US Sales Only), PC A06/MF A01	DE83781096	MN -4	8:57435
25	NTIS (US Sales Only), PC A06/MF A01	DE83781106	MN -25	8:57319
26	NTIS (US Sales Only), PC A06/MF A01	DE83781129	MN -25	8:57373
27	NTIS (US Sales Only), PC A05/MF A01	DE83781101	MN -4	8:57900
28	NTIS (US Sales Only), PC A04/MF A01	DE83781097	MN -4	8:57374
30	NTIS (US Sales Only), PC A08/MF A01	DE83781132	MN -11	8:57609
31	NTIS (US Sales Only), PC A04/MF A01	DE83781098	MN -4	8:57449
32	NTIS (US Sales Only), PC A06/MF A01	DE83781099	MN -4	8:57436
33	NTIS (US Sales Only), PC A03/MF A01	DE83781130	MN -25	8:57375
34	NTIS (US Sales Only), PC A02/MF A01	DE83781109	MN -25	8:57376
35	NTIS (US Sales Only), PC A02/MF A01	DE83781108	MN -25	8:57500
36	NTIS (US Sales Only), PC A02/MF A01	DE83781131	MN -25	8:57377
37	NTIS (US Sales Only), PC A02/MF A01	DE83781110	MN -25	8:57320
38	NTIS (US Sales Only), PC A02/MF A01	DE83781111	MN -25	8:57321
40	NTIS (US Sales Only), PC A02/MF A01	DE83781112	MN -25	8:57322
41	NTIS (US Sales Only), PC A02/MF A01	DE83781113	MN -25	8:57323
42	NTIS (US Sales Only), PC A02/MF A01	DE83781114	MN -25	8:57324
43	NTIS (US Sales Only), PC A02/MF A01	DE83781115	MN -25	8:57325
44	NTIS (US Sales Only), PC A02/MF A01	DE83781116	MN -25	8:57326
45	NTIS (US Sales Only), PC A02/MF A01	DE83781117	MN -25	8:57327
46	NTIS (US Sales Only), PC A02/MF A01	DE83781118	MN -25	8:57378
47	NTIS (US Sales Only), PC A02/MF A01	DE83781119	MN -25	8:57379
48	NTIS (US Sales Only), PC A02/MF A01	DE83781120	MN -25	8:57328
49	NTIS (US Sales Only), PC A02/MF A01	DE83781121	MN -25	8:57329
50	NTIS (US Sales Only), PC A02/MF A01	DE83781122	MN -25	8:57330
51	NTIS (US Sales Only), PC A02/MF A01	DE83781123	MN -25	8:57331
52	NTIS (US Sales Only), PC A02/MF A01	DE83781124	MN -25	8:57332
53	NTIS (US Sales Only), PC A05/MF A01	DE83781125	MN -25	8:56939
54	NTIS (US Sales Only), PC A02/MF A01	DE83781126	MN -25	8:57333
55	NTIS (US Sales Only), PC A02/MF A01	DE83781127	MN -25	8:57334
56	NTIS (US Sales Only), PC A02/MF A01	DE83781128	MN -25	8:57335
INIS-mf-				
8046	NTIS (US Sales Only), PC A02/MF A01	DE84780011	MN -48	8:57682
8047	NTIS (US Sales Only), PC A02/MF A01	DE83703591	MN -48	8:57692
8048	NTIS (US Sales Only), PC A02/MF A01	DE83703587	MN -48	8:57693
8049	NTIS (US Sales Only), PC A02/MF A01	DE83703588	MN -48	8:57694
8051	NTIS (US Sales Only), PC A02/MF A01	DE83703589	MN -48	8:57683
8052	NTIS (US Sales Only), PC A02/MF A01	DE83703586	MN -48	8:57695
8053	NTIS (US Sales Only), PC A02/MF A01	DE83703590	MN -48	8:57696
8191	NTIS (US Sales Only), PC A04/MF A01	DE83781092	MN -34C	8:57893
8192	NTIS (US Sales Only), PC A03/MF A01	DE83781133	MN -11	8:57647
8195	NTIS (US Sales Only), PC A06/MF A01	DE83781089	MN -34C	8:57903
8196	NTIS (US Sales Only), PC A05/MF A01	DE83781088	MN -21	8:57921
8198	NTIS (US Sales Only), PC A03/MF A01	DE83781107	MN -86	8:56943
8201	NTIS (US Sales Only), PC A05/MF A01	DE83781093	MN -34C	8:57896
8473	NTIS (US Sales Only), PC A19/MF A01	DE84780007	MN -34C	8:57973
8532	NTIS (US Sales Only), PC A06/MF A01	DE83703579	MN -34D	8:57861
8533	NTIS (US Sales Only), PC A05/MF A01	DE83703580	MN -34D	8:57862
8534	NTIS (US Sales Only), PC A06/MF A01	DE83703584	MN -11	8:57740
8537	NTIS (US Sales Only), PC A24/MF A01	DE84780008	MN -4	8:57496

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8538	NTIS (US Sales Only), PC A05/MF A01	DE83703576	MN -34A	8:57794
8539	NTIS (US Sales Only), PC A07/MF A01	DE83703577	MN -34A	8:57795
8540	NTIS (US Sales Only), PC A07/MF A01	DE83703581	MN -34C	8:57889
8541	NTIS (US Sales Only), PC A06/MF A01	DE83703578	MN -34A	8:57796
8545	NTIS (US Sales Only), PC A03/MF A01	DE83703585	MN -11	8:57605
8549	NTIS (US Sales Only), PC A06/MF A01	DE83703582	MN -25	8:57892
8556	NTIS (US Sales Only), PC A09/MF A01	DE83703583	MN -34C	8:57901
8560	NTIS (US Sales Only), PC A03/MF A01	DE83781086	MN -34	8:57765
8561	NTIS (US Sales Only), PC A07/MF A01	DE83781134	MN -48	8:57700
8562	NTIS (US Sales Only), PC A06/MF A01	DE83781135	MN -48	8:57701
8563	NTIS (US Sales Only), PC A05/MF A01	DE83781090	MN -34C	8:57551
8564	NTIS (US Sales Only), PC A06/MF A01	DE83781100	MN -4	8:57470
8575	NTIS (US Sales Only), PC A20/MF A01	DE83781087	MN -34	8:58001
INIS-SU-				
171	NTIS (US Sales Only), PC A07/MF A01	DE83781136	MN -41	8:57702
179	NTIS (US Sales Only), PC A06/MF A01	DE84780014	MN -48	8:57672
INPE-				
2665-PRE/ 275	*See* N-8322690			8:57610
IPP-				
1/ 210	NTIS (US Sales Only), PC A04/MF A01	DE83751276	MN -20	8:57922
1/ 212	NTIS (US Sales Only), PC A03/MF A01	DE83751109	MN -20	8:57923
1/ 214	NTIS (US Sales Only), PC A02/MF A01	DE83751264	MN -20	8:57975
2/ 263	NTIS (US Sales Only), PC A03/MF A01	DE83751277	MN -20	8:57924
6/ 215	NTIS (US Sales Only), PC A04/MF A01	DE83751278	MN -20	8:57925
III/ 81	*See* IPP-1/212	DE83751109	MN -20	8:57923
JAERI-M-				
82-026	NTIS (US Sales Only), PC A02/MF A01	DE83703721	MN -25	8:57380
82-030	NTIS (US Sales Only), PC A03/MF A01	DE83703722	MN -25	8:57341
82-052	NTIS (US Sales Only), PC A03/MF A01	DE83703723	MN -25	8:57342
82-054	NTIS (US Sales Only), PC A02/MF A01	DE83703727	MN -25	8:57976
82-062	NTIS (US Sales Only), PC A03/MF A01	DE83703724	MN -25	8:57343
82-090	NTIS (US Sales Only), PC A03/MF A01	DE83703726	MN -25	8:57381
JPL-				
9950-801	*See* N-8324450			8:57776
9950-806	*See* N-8322742			8:57049
9950-810	*See* N-8322745			8:57050
JPL-PUB-				
83-42	*See* DOE/ET/12548-17	DE84000882	STD -88	8:56860
JPL-PUBL-				
83-7	*See* N-8321511			8:57530
83-9	*See* DOE/JPL-1012-79A	DE84001226	STD -63b	8:57041
Juel-				
1750	NTIS (US Sales Only), PC A10/MF A01	DE83751106	MN -80	8:57164
1786	Fachinformationszentrum Energie, Physik, Mathematik, Karlsruhe (Germany, F.R.)			8:57344
1807	NTIS (US Sales Only), PC A04/MF A01	DE83751121	MN -25	8:57514
1817	NTIS (US Sales Only), PC A04/MF A01	DE83751287	MN -25	8:57421
1825	NTIS (US Sales Only), PC A05/MF A01	DE83751279	MN -20	8:57977
1826	NTIS (US Sales Only), PC A07/MF A01	DE83751125	MN -80	8:57143
1827	NTIS (US Sales Only), PC A04/MF A01	DE83751284	MN -77	8:57978
1831	NTIS (US Sales Only), PC A06/MF A01	DE83751170	MN -77	8:57422
Juel-Spez-				
136/ Bd.6	NTIS (US Sales Only), PC A06/MF A01	DE83751263	MN -77	8:57175
175	NTIS (US Sales Only), PC A03/MF A01	DE83751084	MN -25	8:57673
187	NTIS (US Sales Only), PC A09/MF A01	DE83751108	MN -77	8:57144
196	NTIS (US Sales Only), PC A06/MF A01	DE83751281	MN -34D	8:57908
KEK-				
80-15	NTIS (US Sales Only), PC A03/MF A01	DE83781083	MN -38	8:57501
KFK-				
3241	NTIS (US Sales Only), PC A02/MF A01	DE83751145	MN -83	8:56964
3335	NTIS (US Sales Only), PC A02/MF A01	DE83751122	MN -80	8:57148
3346	NTIS (US Sales Only), PC A06/MF A01	DE83751087	MN -78	8:57176
3366	NTIS (US Sales Only), PC A11/MF A01	DE83751167	MN -79p	8:57177
3373	NTIS (US Sales Only), PC A05/MF A01	DE83751151	MN -78	8:57178
3375	NTIS (US Sales Only), PC A08/MF A01	DE83751120	MN -25	8:57382
3394	NTIS (US Sales Only), PC A03/MF A01	DE83751153	MN -79	8:57149
3428	NTIS (US Sales Only), PC A05/MF A01	DE83751140	MN -70	8:56965
3438	NTIS (US Sales Only), PC A04/MF A01	DE83751275	MN -70	8:56966
3446	NTIS (US Sales Only), PC A05/MF A01	DE83751143	MN -28	8:57552
3456	NTIS (US Sales Only), PC A08/MF A01	DE83751262	MN -11	8:57606
3472	NTIS (US Sales Only), PC A05/MF A01	DE83751110	MN -37	8:57571
3473	NTIS (US Sales Only), PC A09/MF A01	DE83751111	MN -47	8:56941
3475	NTIS (US Sales Only), PC A04/MF A01	DE83751141	MN -11	8:57655
3476	NTIS (US Sales Only), PC A03/MF A01	DE83751169	MN -79	8:57179
3478	NTIS (US Sales Only), PC A06/MF A01	DE83751160	MN -98F	8:57226
3480	NTIS (US Sales Only), PC A04/MF A01	DE83751165	MN -80	8:57607
3498	NTIS (US Sales Only), PC A02/MF A01	DE83751088	MN -15	8:56990
3501	NTIS (US Sales Only), PC A02/MF A01	DE83751266	MN -25	8:57345
3502	NTIS (US Sales Only), PC A09/MF A01	DE83751107	MN -11	8:57437
3503	NTIS (US Sales Only), PC A04/MF A01	DE83751119	MN -34C	8:57902
3506	NTIS (US Sales Only), PC A03/MF A01	DE83751142	MN -25	8:57346
3510	NTIS (US Sales Only), PC A03/MF A01	DE83751144	MN -86	8:57438
3512-B	NTIS (US Sales Only), PC A25/MF A01	DE83751288	MN -2	8:57291
3513-B	NTIS (US Sales Only), PC A20/MF A01	DE83751280	MN -80	8:57132
3530	NTIS (US Sales Only), PC A03/MF A01	DE83751168	MN -11	8:57650

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3533	NTIS (US Sales Only), PC A03/MF A01	DE83751166	MN -86	8:56945
3535	NTIS (US Sales Only), PC A13/MF A01	DE83751163	MN -41	8:57518
3541-B	NTIS (US Sales Only), PC A09/MF A01	DE83751283	MN -80	8:57134
3544	NTIS (US Sales Only), PC A02/MF A01	DE83751150	MN -86	8:56946
3546	NTIS (US Sales Only), PC A04/MF A01	DE83751152	MN -78	8:57180
KFK-AFR-				
006	NTIS (US Sales Only), PC A14/MF A01	DE83751274	MN -11	8:57601
KFK-PFT-				
51	NTIS (US Sales Only), PC A10/MF A01	DE83751265	MN -32	8:58008
KFK-tr-				
683	NTIS (US Sales Only), PC A02/MF A01	DE83751123	MN -2	8:57453
KFKI-				
1982-23	NTIS (US Sales Only), PC A02/MF A01	DE84900038	MN -34A	8:57852
KURRI-TR-				
203	NTIS (US Sales Only), PC A06/MF A01	DE83781084	MN -80	8:57155
KY-				
735	NTIS, PC A03/MF A01	DE84001584	STD -71	8:57502
LA-tr-				
83-16	NTIS, PC A02/MF A01; 1	DE84000420	MN -15	8:56994
83-17	NTIS, PC A02/MF A01	DE84001205	MN -28	8:57545
LA-UR-				
83-1893	NTIS, PC A02/MF A01	DE83014146	MN -32	8:58005
83-2290	NTIS, PC A02/MF A01	DE83017605	MN -38	8:57582
83-2567	NTIS, PC A02/MF A01	DE84001400	MN -20d	8:57979
83-2568	NTIS, PC A02/MF A01	DE84001365	MN -21	8:57980
83-2570	NTIS, PC A02/MF A01; 1	DE84001366	MN -20d	8:57981
83-2572	NTIS, PC A02/MF A01; 1	DE84001359	MN -20c	8:57347
83-2580	NTIS MF A01; 2	DE84001362	MN -34	8:57926
83-2587	NTIS, PC A02/MF A01	DE84001356	MN -34C	8:57895
83-2588	NTIS, PC A02/MF A01	DE84001357	MN -28	8:57536
83-2589	NTIS, PC A02/MF A01; 1	DE84001358	MN -70B	8:56967
83-2590	NTIS, PC A02/MF A01; 1	DE84001351	MN -70B	8:56983
83-2592	NTIS, PC A02/MF A01	DE84001353	MN -28	8:57565
83-2593	NTIS, PC A02/MF A01	DE84001354	MN -38	8:57566
83-2601	NTIS, PC A02/MF A01; 1	DE84000369	MN -34	8:57982
83-2602	NTIS, PC A02/MF A01	DE84001346	MN -34	8:57983
83-2610	NTIS, PC A02/MF A01	DE84001345	MN -34D	8:57863
83-2613	NTIS, PC A02/MF A01	DE84001347	MN -4	8:56942
83-2646	NTIS, PC A02/MF A01; 1	DE84001341	MN -59c	8:57093
83-2647	NTIS, PC A02/MF A01	DE84001340	MN -59c	8:57094
83-2648	NTIS, PC A02/MF A01	DE84001339	MN -34C	8:57874
83-2670	NTIS, PC A02/MF A01	DE84001336	MN -34	8:57927
83-2671	NTIS, PC A02/MF A01	DE84001323	MN -34	8:57928
83-2692	NTIS, PC A02/MF A01; 1	DE84001317	MN -28	8:57553
83-2702	NTIS, PC A02/MF A01; 1	DE84001330	MN -28	8:57537
83-2703	NTIS, PC A02/MF A01; 1	DE84001335	MN -28	8:57538
83-2742	NTIS, PC A02/MF A01	DE84001311	MN -20c	8:57348
83-2783	NTIS, PC A02/MF A01; 1	DE84001304	MN -20c	8:57383
83-2840	NTIS, PC A03/MF A01; 1	DE84001038	MN -21	8:57984
83-2844	NTIS, PC A02/MF A01	DE84001039	MN -34B	8:57772
83-2851	NTIS, PC A04/MF A01	DE84001017	MN -34C	8:57905
83-2862	NTIS, PC A02/MF A01	DE84001018	MN -32	8:58009
LAL-				
83-2	*See* DESY-83-017	DE83751114	MN -34D	8:57855
83-3	*See* DESY-83-018	DE83751115	MN -34D	8:57856
LBL-				
14519	NTIS, PC A02/MF A01	DE84001041	MN -66a	8:57104
14984	NTIS, PC A02/MF A01	DE84001045	MN -94a	8:57204
15010	NTIS, PC A07/MF A01; 1	DE84001066	MN -70	8:56968
15616	NTIS, PC A02/MF A01; 1	DE84001328	MN -20a	8:57985
15636	NTIS, PC A03/MF A01	DE84000937	MN -95d	8:57264
15936	NTIS, PC A02/MF A01	DE84001079	MN -90a	8:56830
15985	NTIS, PC A02/MF A01	DE84001326	MN -90a	8:56831
16040	NTIS, PC A02/MF A01	DE84001097	MN -4	8:57477
16106	NTIS, PC A02/MF A01	DE84000400	MN -37	8:57583
16217	NTIS, PC A05/MF A01	DE84000528	STD -28	8:57554
16235	NTIS, PC A04/MF A01	DE84000957	MN -94cc	8:57210
16390	NTIS, PC A03/MF A01	DE84000722	MN -34C	8:57906
16420	NTIS, PC A04/MF A01	DE84000472	MN -34D	8:57869
16509	NTIS, PC A07/MF A01	DE84001047	MN -34A	8:57798
16541	NTIS, PC A02/MF A01	DE84001037	MN -34D	8:57870
16556	NTIS, PC A03/MF A01	DE84001640	STD -94c	8:57211
16557	NTIS, PC A04/MF A01	DE84001846	STD -94cd	8:57212
16558	NTIS, PC A02/MF A01	DE84001215	MN -94	8:57213
16577	NTIS, PC A05/MF A01	DE84000938	MN -4	8:57630
16586	NTIS, PC A04/MF A01	DE84001243	MN -4	8:57462
16632	NTIS, PC A02/MF A01	DE84001348	STD -32	8:57915
16726	NTIS, PC A02/MF A01; 1	DE84001665	MN -25	8:57349
LCC-				
007/ 82	NTIS (US Sales Only), PC A02/MF A01	DE83703725	MN -25	8:57503
LMF-				
103	NTIS, PC A05/MF A01	DE84001089	MN -48	8:56890
MINTEK-M-				
37	NTIS (US Sales Only), PC A03/MF A01	DE83703730	MN -51	8:56936

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MLM-				
3099	NTIS, PC A02/MF A01	DE84001678	STD -37	8:57515
3105(OP)	NTIS, PC A02/MF A01; 1	DE84000362	MN -38	8:57497
MTR-				
83-W26	*See* DOE/ET/13800-1	DE83018030	STD -90d	8:56815
N-				
8321501	Avail: British Library Lending Div., Boston Spa, Engl.			8:57239
8321502	Avail: British Library Lending Div., Boston Spa, Engl.			8:57277
8321505	NTIS, PC A04/MF A01			8:56832
8321506	NTIS, PC A11/MF A01			8:57127
8321510	NTIS, PC A02/MF A01			8:57046
8321511	NTIS, PC A05/MF A01			8:57530
8321512	NTIS, PC A04/MF A01			8:57047
8321513	NTIS, PC A06/MF A01			8:57059
8321514	NTIS, PC A03/MF A01			8:57060
8321644	Avail: British Library Lending Div., Boston Spa, Engl.			8:57529
8321649	Avail: Subcomm. on Human Rights and International Organizations			8:57234
8322179	NTIS, PC A06/MF A01			8:57273
8322673	NTIS, PC A05/MF A01			8:57230
8322674	NTIS, PC A05/MF A01			8:56893
8322675	NTIS, PC A05/MF A01			8:56856
8322676	NTIS, PC A05/MF A01			8:57128
8322677	NTIS, PC A05/MF A01			8:56923
8322678	NTIS, PC A05/MF A01			8:57101
8322683	NTIS, PC A04			8:56894
8322687	NTIS, PC A02/MF A01			8:56864
8322690	NTIS, PC A03/MF A01			8:57610
8322737	Avail: British Library Lending Div., Boston Spa, Engl.			8:57242
8322738	Avail: British Library Lending Div., Boston Spa, Engl.			8:57241
8322741	NTIS, PC A04/MF A01			8:57048
8322742	NTIS, PC A04/MF A01			8:57049
8322745	NTIS, PC A02/MF A01			8:57050
8322752	Avail: Subcommittee on Energy Conservation and power			8:57246
8322753	Avail: Committee on Energy and Natural Resources			8:56904
8322756	NTIS, PC A11/MF A01			8:57061
8322757	NTIS, PC A03/MF A01			8:57254
8322761	NTIS, PC A07/MF A01			8:56847
8322762	NTIS, PC A07/MF A01			8:56895
8322763	NTIS, PC A07/MF A01			8:56848
8322764	NTIS, PC A07/MF A01			8:56851
8322765	NTIS, PC A07/MF A01			8:56896
8322846	Avail: Committee on Energy and Natural Resources			8:57596
8323011	NTIS, PC A13/MF A01			8:57504
8324438	NTIS, PC A03/MF A01			8:57773
8324443	NTIS, PC A02/MF A01			8:57774
8324445	NTIS, PC A02/MF A01			8:57775
8324450	NTIS, PC A03/MF A01			8:57776
8324452	NTIS, PC A02/MF A01			8:57777
8324453	NTIS, PC A02/MF A01			8:57778
8324454	NTIS, PC A05/MF A01			8:57779
8324455	NTIS, PC A07/MF A01			8:57780
8324457	NTIS, PC A03/MF A01			8:57781
8324463	NTIS, PC A02/MF A01			8:57782
8324465	NTIS, PC A03/MF A01			8:57051
8325630	NTIS, PC A03/MF A01			8:57783
8325634	NTIS, PC A03/MF A01			8:57784
8325638	NTIS, PC A02/MF A01			8:57754
8325640	NTIS, PC A03/MF A01			8:57785
8325641	NTIS, PC A02/MF A01			8:57786
8325645	NTIS, PC A02/MF A01			8:57787
8325646	NTIS, PC A04/MF A01			8:57788
NASA-CR-				
167890	*See* N-8322756			8:57061
168131	*See* DOE/NASA-2701-3	DE84001696	STD -93	8:57253
170037	*See* N-8321512			8:57047
170121	*See* N-8321511			8:57530
170123	*See* N-8321510			8:57046
170205	*See* N-8322745			8:57050
170209	*See* N-8322741			8:57048
170212	*See* N-8322742			8:57049
170237	*See* N-8324450			8:57776
170238	*See* N-8324443			8:57774
170284	*See* N-8324454			8:57779
170295	*See* N-8324452			8:57777
170307	*See* N-8325645			8:57787
170311	*See* N-8325638			8:57754
170315	*See* N-8325640			8:57785
170335	*See* N-8325634			8:57784
170339	*See* N-8325641			8:57786
170744	*See* N-8324453			8:57778
NASA-TM-				
83066	*See* DOE/NASA/13111-15	DE84000245	STD -90f	8:56827
84359	*See* N-8325630			8:57783
84967	*See* N-8322757			8:57254

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84998	*See* N-8324455			8:57780
85001	*See* N-8322687			8:56864
85004	*See* N-8324445			8:57775
849700	*See* N-8324463			8:57782
NASA-TM-X-				
2576	NTIS, PC A02/MF A01		MN -25	8:57350
NASA-TN-D-				
4955	NTIS, PC A03/MF A01		MN -25	8:57351
NASA-TP-				
2168	*See* N-8325646			8:57788
NIIAR-				
45(560)	NTIS (US Sales Only), PC A02/MF A01	DE83703728	MN -25	8:57384
NMERDI-				
2-71-4607	New Mexico Energy Research and Development Institute, 117 Richmond Drive NE, Albuquerque, NM 87106		MN -90	8:56833
NRL-MR-				
5170	NTIS, PC A02/MF A01	DE84000640	MN -21	8:57986
NU-				
1982-8	Stockholm, Sweden; Liber distribution, Foerlagsorder (1982).			8:57231
NUCLEBRAS-CDTN-				
428	NTIS (US Sales Only), PC A06/MF A01	DE83703711	MN -25	8:57352
NUREG-				
0540-Vol.5-No.7	NTIS MF A01; 2 - GPO	DE84900181	MN -2	8:57240
0996	NTIS, PC A04/MF A01; 1 - GPO $4.50	DE84900095	MN -80	8:57181
NUREG/CR-				
1278	NTIS, PC A99/MF A01 - GPO	DE84001077	MN -80	8:57182
2507	NTIS MF A01; 2 - GPO $6.50	DE84900127	MN -2	8:57162
2575-R2	NTIS, PC A03/MF A01 - GPO $3.75	DE84900243	MN -78	8:57183
3050	NTIS, PC A04/MF A01 - GPO $4.50	DE84900085	MN -80	8:57184
3200-Vol.2	NTIS, PC A02/MF A01 - GPO	DE84000912	MN -78	8:57138
3274	NTIS, PC A07/MF A01 - GPO	DE84000894	MN -80	8:57135
3330	NTIS, PC A03/MF A01 - GPO	DE84001185	MN -80	8:57185
3401-R7	NTIS, PC A04/MF A01 - GPO	DE84000884	MN -79	8:57186
3421	NTIS, PC A08/MF A01; 1 - GPO	DE84001183	MN -78	8:57187
3462	NTIS PC E04/MF A01 - GPO	DE84001521	MN -78	8:57188
3486	NTIS, PC A04/MF A01 - GPO $4.50	DE84900191	MN -70B	8:56984
NYSERDA-				
82-20	NTIS, PC A04/MF A01	DE84001432	MN -94c	8:57205
83-3	*See* PB-83-262568		MN -13	8:57035
83-3-App.	*See* PB-83-262576		MN -13	8:57036
83-11	NTIS, PC A03/MF A01; 1	DE84900177	MN -90	8:56834
83-12	NTIS, PC A05/MF A01	DE84001600	MN -95d	8:57265
OEFZS-				
4207	NTIS (US Sales Only), PC A03/MF A01	DE83703712	MN -25	8:57353
4208	NTIS (US Sales Only), PC A03/MF A01	DE83703713	MN -25	8:57354
OEFZS-A-				
0390	Available by the author, OEFZS, A-2444 Seibersdorf, Austria		ND -48	8:57703
0412	Available by the Austrian Academy of Sciences, Dr. Ignaz Seipelplatz 2, 1010 Vienna		MN -25	8:57355
ONWI-				
505	NTIS, PC A09/MF A01	DE84001675	MN -70	8:56985
ORAU/IEA-				
83-2(M) -Rev.	NTIS, PC A05/MF A01; 1	DE83017859	MN -78	8:57189
ORNL-				
5888	NTIS, PC A06/MF A01	DE84000347	MN -32	8:57738
5950	NTIS, PC A04/MF A01	DE84001149	MN -70	8:57755
5967	NTIS, PC A04/MF A01; 1	DE84001581	STD -11	8:58010
ORNL/CON-				
80/ R1	NTIS PC E11/MF $5.00	DE84001577	MN -95d	8:57266
138	NTIS, PC A05/MF A01	DE84001579	MN -95e	8:57267
ORNL/CSD-				
122	NTIS, PC A03/MF A01	DE84001587	STD -32	8:57356
ORNL/CSD/TM-				
207	NTIS PC E04/MF A01	DE84000336	STD -32	8:58017
ORNL/ENG/TM-				
29	NTIS, PC A05/MF A01; 1	DE84001489	STD -90d	8:56835
ORNL/FMP-				
83-3	NTIS, PC A20/MF A01; 1	DE84000646	MN -90	8:56836
ORNL/Sub-				
79-21453/ 15	NTIS, PC A04/MF A01	DE84001242	MN -38	8:57521
80-7800/ 1	NTIS, PC A03/MF A01	DE84001580	MN -95d	8:57268
81-9063/ 1	NTIS, PC A02/MF A01	DE84001528	STD -94a	8:57206
ORNL/TM-				
8658	NTIS, PC A14/MF A01; 1	DE84001588	MN -90	8:57129
8695	NTIS, PC A03/MF A01	DE84001583	STD -70	8:56969
8750	NTIS, PC A04/MF A01	DE84000258	STD -20f	8:57929
8754	*See* NUREG/CR-3274	DE84000894	MN -80	8:57135
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DK	Denmark
DO	Dominican Republic
DY	Dahomey
DZ	Algeria
EA	European American Committee Reactor Physics
EC	Ecuador
ED	European American Nuclear Data Committee
EG	Egypt
ER	European Space Research Organization
ES	Spain
ET	Ethiopia
EU	European Company for the Chemical Processing of Irradiated Fuels
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FJ	Fiji
FR	France
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GD	Grenada
GH	Ghana
GM	Gambia
GN	Guinea
GQ	Equatorial Guinea
GR	Greece
GT	Guatemala
GW	Guinea-Bissau
GY	Guyana
HK	Hong Kong
HN	Honduras
HT	Haiti
HU	Hungary
HV	Upper Volta
IA	Inter-American Nuclear Energy Commission
IB	International Bank for Reconstruction and Development
ID	Indonesia
IE	Ireland
IG	Inter-Governmental Maritime Consultative Organization
II	International Commission on Radiation Units and Measurements
IL	Israel

IN India
IO International Labor Organization
IP International Union of Pure and Applied Physics
IQ Iraq
IR Iran
IS Iceland
IT Italy
IX International Union of Pure and Applied Chemistry

JM Jamaica
JO Jordan
JP Japan

KE Kenya
KH Cambodia
KP Democratic People's Republic of Korea
KR Korea, Republic of
KW Kuwait

LA Laos
LB Lebanon
LI Liechtenstein
LK Sri Lanka
LR Liberia
LS Lesotho
LU Luxembourg
LY Libyan Arab Republic

MA Morocco
MC Monaco
MG Madagascar
ML Mali
MN Mongolia
MR Mauritania
MT Malta
MU Mauritius
MV Maldives
MW Malawi
MX Mexico
MY Malaysia

NE Niger
NG Nigeria
NI Nicaragua
NL Netherlands
NO Norway
NP Nepal
NR Nauru
NZ New Zealand

OE Organization for Economic Cooperation and Development
OM Oman

PA Panama
PE Peru
PG Papua New Guinea
PH Philippines
PK Pakistan
PL Poland
PR Puerto Rico
PT Portugal
PY Paraguay

QA Qatar

RH Southern Rhodesia
RO Romania
RW Rwanda

SA Saudi Arabia
SD Sudan
SE Sweden
SG Singapore
SK Sikkim
SL Sierra Leone
SM San Marino
SN Senegal
SO Somalia
SU Union of Soviet Socialist Republics (USSR)
SV El Salvador
SY Syria
SZ Swaziland

TC Trucial Oman
TD Chad
TG Togo
TH Thailand
TN Tunisia
TO Tonga
TR Turkey
TT Trinidad and Tobago
TW Taiwan
TZ United Republic of Tanzania

UA Ukrainian Soviet Socialist Republic (Ukrainian SSR)
UE United Nations Educational, Scientific and Cultural Organization
UF United Nations Children's Fund
UG Uganda
UI United Nations Industrial Development Organization
US United States of America (USA)
UY Uruguay

VA Holy See
VD Democratic Republic of Viet-Nam
VE Venezuela
VS Republic of Viet-Nam

WM World Meteorological Organization
WS Western Samoa

XA International Atomic Energy Agency (IAEA)
XC European Organization for Nuclear Research (CERN)
XE Commission of the European Communities (CEC)
XF Food and Agriculture Organization of the United Nations (FAO)
XJ Joint Institute for Nuclear Research (JINR)
XM Council for Mutual Economic Assistance (CMEA)
XN Nuclear Energy Agency of the OECD (NEA)
XO Organization of African Unity (OAU)
XR International Commission on Radiological Protection (ICRP)
XS International Organization for Standardization (ISO)
XU United Nations (UN)
XW World Health Organization (WHO)
XX World Energy Conference (WEC)

YD Democratic Yemen
YE Yemen
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire

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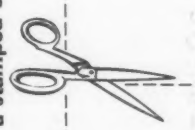

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